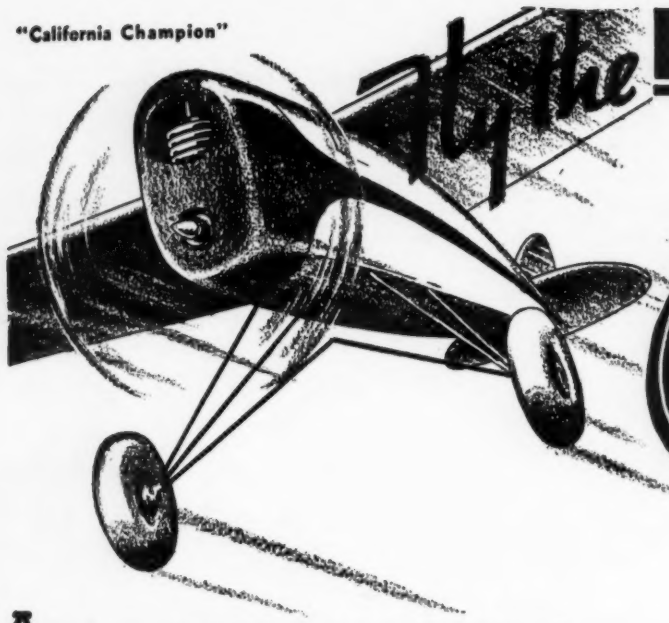
MODEL AIRPLANE NEWS

Publication

1937

20c

"California Champion"



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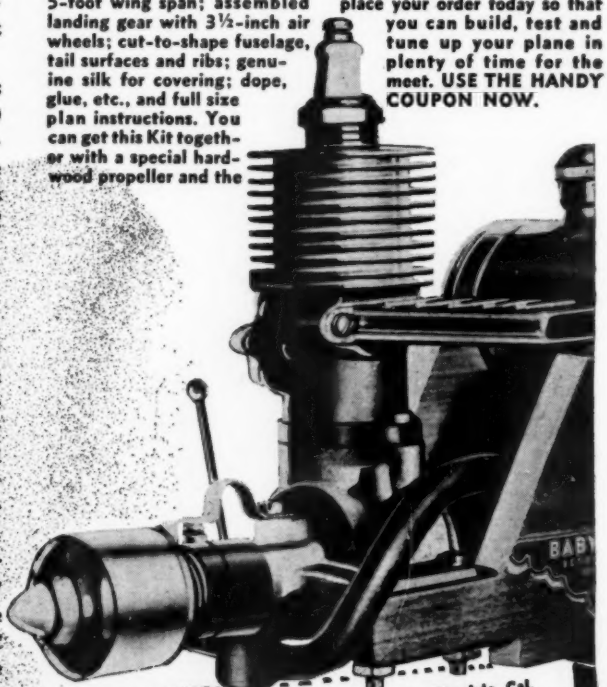

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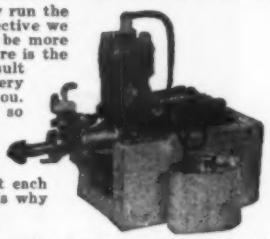

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23. Strongest miniature motor.
24. LOWEST PRICE EVER SET.

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These are the giant models that have amazed the model builders of America. Imagine strong outdoor flyers that are actually one-third the size of passenger carrying planes—a $10 value for only $1.00. Everything is in the kit including all liquids—nothing else to buy!

CONTENTS: Each of these new G.H.Q. Giant 5 ft. Model Planes contains full-size Plans, all ribs, formers and curved parts clearly printed on best grade Balsa. Large bottles Cement and Dope, different colors Japanese Tissue, Special Endurance Rubber, finished Ready-Cut 3" Wheels, Wire, Balsa strips cut to size, Washers, and . . . . Movable Controls, shock-proof Landing Gear, Scale Details, Lettering, Numbering and Insignias, Flight Log, etc.

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8th YEAR OF PUBLICATION

VOL. XVI *No. 4*

Edited by Charles Hampson Grant

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In Our Next Issue

There will be many things which you should not miss. One of them is a very enlightening article by Carl Goldberg on **Designing and Adjusting Indoor Models.**

The Fifth Navi-Goid Contest, by E. Semler will appear. This is invaluable if you eventually wish to get into aviation, for it gives you a groundwork in the principles of air navigation.

One of the high lights of the next issue is the announcement and details of the I.G.M.A.A. Eastern States Gas Model Contest which will be held on May 22nd, at Hadley Field, New Jersey. This is to be widely announced and model fliers from many units throughout all of the eastern states should be on hand.

Our regular features also will appear, as well as many other very unique and interesting articles on all phases of model designing, building and flying.

We regret that it was impossible to include in this issue the third and final part of **Building A Streamline Gas Model.** It will appear in the May issue.

If you wish to know more about this issue we suggest that you go to the newsstand and examine the wealth of information contained within its covers.

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from *Reginald Denny*

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Complete Kit, only $1.00

REGINALD DENNY'S

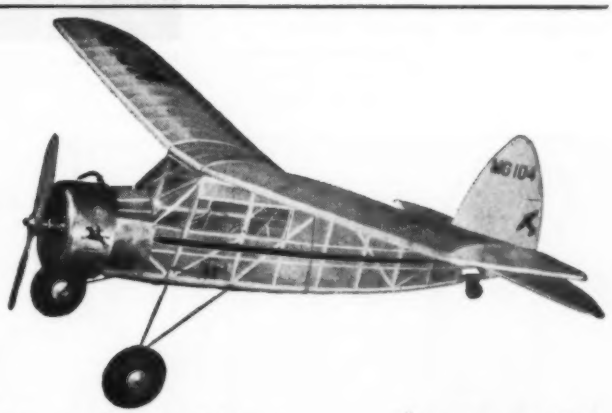
COMING! Nationwide Gas Model Contest

Watch This Magazine for Full Details

That Amazing Performer

The DENNY JUNIOR

Public response to this model PROVES what we have told you about the DENNY JUNIOR. Sales are climbing every month. Hundreds of model builders testify to its performance. *The certified N.A.A. flight of one hour forty seven minutes* was made by a stock kit under average conditions. No records were attempted. The N.A.A. timing was used so that the results could not be questioned. There are many CHEAPER kits on the market but NONE BETTER. It is not necessary to spend ONE PENNY MORE than the purchase price to build a complete model. The kit contains finished spun cowl, finished propeller, cut out ribs, finest ivory silk covering, selected balsa and bass wood, ample supplies of cement and dope, Swedish steel landing gear wire, 3½-in. pneumatic wheels, complete full size plans, haskalite and metal for firewall, motor mount, etc., and all screws, nuts and bolts necessary.



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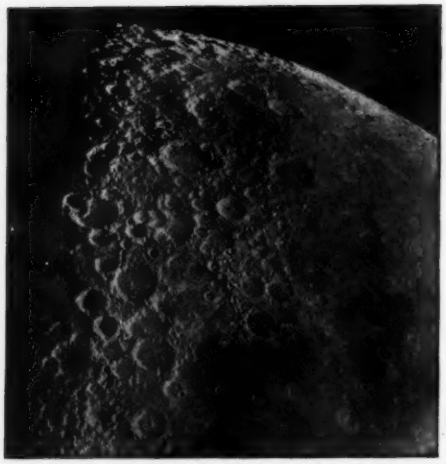
What About Rockets?

How Rockets Operate and How They Have Been Developed From Their Early Stages to the Present Day

By NICK LIMBER



A part of the surface of the moon as seen through a telescope

EXTRA! EXTRA!! E-X-T-R-A!!!

"Scientists land on moon—scientists land on moon. Read all about it . . ."

This will be the cry we may expect to hear within the next generation. To make this cry possible men have been laboring in field and laboratory for many years. These men are called astronauts and have but one ambition . . . to reach other planets.

Because few people are acquainted with this rapidly developing science of space travel we shall endeavor to explain some of its mysteries.

To get to other planets we must overcome many obstacles. Perhaps the greatest of these obstacles is space itself. Because of lack of air a trip to the moon, Mars or Venus seemed inconceivable until the Russian scientist, Ziolkovsky, discovered that a rocket could function in a vacuum. This great, though simple, observation was published in 1903, the same year that the Wright Brothers made their first airplane flight at Kitty Hawk, Va. The world, however, at that time not being familiar with the simplest air plane, ridiculed the thought of space flight.

Even today it is hard to appreciate Ziolkovsky's discovery because of the common belief that a rocket depends for propulsion upon the pushing of its exhaust gases on the air behind it.

The propulsion of a rocket depends upon Newton's Third Law of Motion, which states, "For every action there is an equal and opposite reaction." It is this reaction caused by the exhaust of the exploding fuels that moves the rocket forward.

A practical example of this is the "kick" which accompanies the firing of a rifle. This "kick" is nothing more than reaction and is experienced regardless of the presence or absence of air. Actual tests show that the "kick" is even greater during the absence of air, thereby proving that a rocket could function better in a vacuum where there is no resistance offered to the exhaust gases.

As reaction is the only known means of propulsion that can be utilized in space, man must develop the rocket if he is to visit neighboring planets. Unfortunately, however, before the rocket can reach into outer space many problems must be solved. To solve these problems men have formed societies through which experiments are conducted.

The first rocket society was formed in Breslau under the direction of Ing. Johannes Winkler and Max Valier.

In discussing the development of the rocket we will first present the experiments of the German Rocket Society as it was the first to be formed and because it has contributed the most toward the advancement of space travel.

The first major experiment was performed within a year after the formation

Nick Limber's dry fuel rocket shown in diagram, page 5

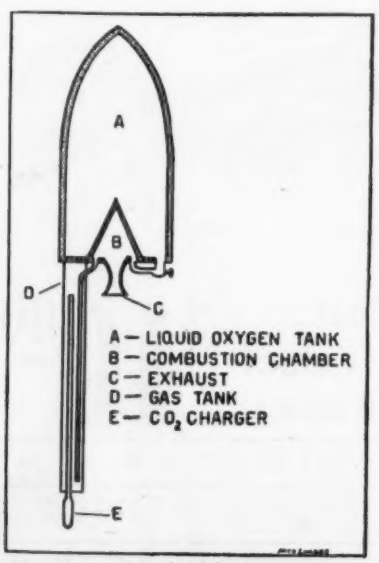


Fig. No. 1. Mirak rocket, number one

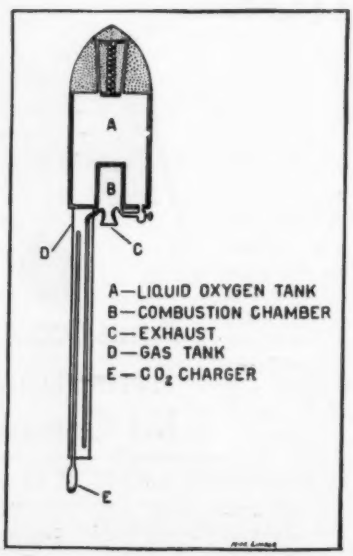


Fig. No. 3. Mirak number 3. Note water jacket and valve

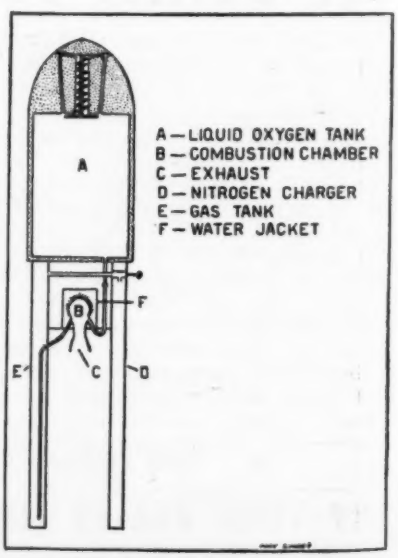
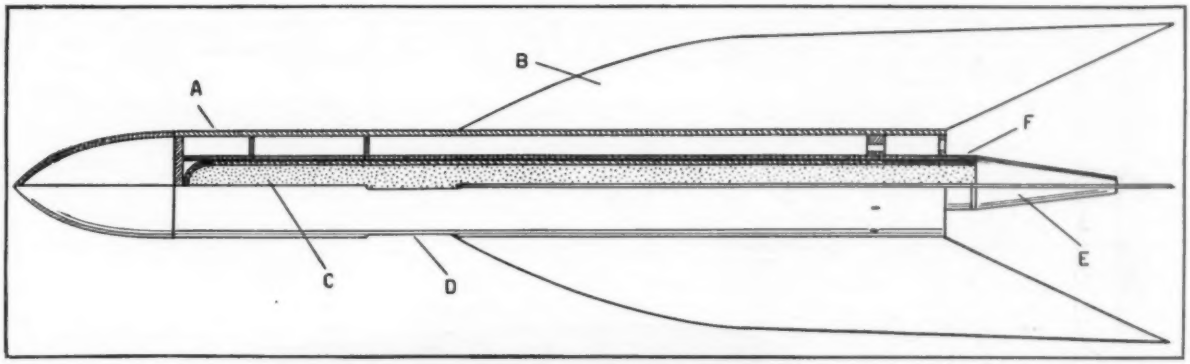


Fig. No. 2. Mirak number 2



Dry fuel rocket designed by the author for the Westchester Society of Rocket Research. A=outer shell, B=fins, C=fuel cartridge, D=air vent, E=exhaust nozzle, F=cartridge chamber

of the society. Fritz von Opel demonstrated a rocket-powered car which was built at his auto plant. The car was the first of its type and was driven over 100 m.p.h. at the Ruesselsheim track on March, 1928. Many other spectacular tests with gliders, sleds and rail cars were conducted before the engineers realized that a new type of fuel was essential. The fuel being used in the experiment was a variety of gun powders. The dry fuel could not be controlled once ignited nor was it powerful enough to propel long distance rockets. One of the first engineers to call attention to this fact was Dr. Robert H. Goddard, the American rocket experimenter. Almost at the same time, Prof. Oberth of Germany and Robert Esnault-Pelterie of France published results of their own experiments pointing to the same conclusions. It was shortly after the publication of these results that all serious rocket experiments were carried on with liquid fuels. Perhaps the only great experimenter that did not abandon the dry fuel rocket was Ing. Reinhold Tiling, who had sent a dry fuel rocket to a height of several miles and set a record that to this day has not been beaten. After his death, which was caused by an exploding forty-pound powder rocket, little consideration was given to the dry fuels.

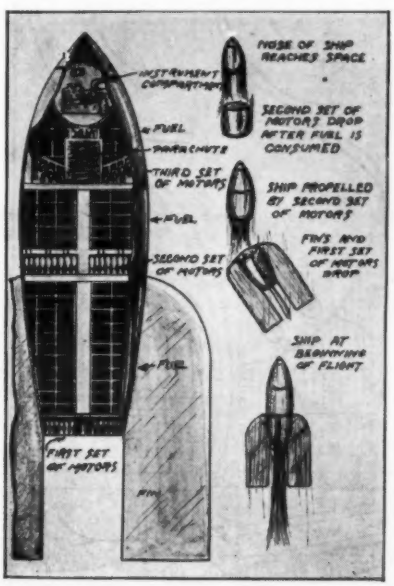
Dummy model of Oberth rocket. (Germany 1931)

Because the German engineers knew little or nothing of liquid propellants, they decided to plan a series of preliminary experiments in order to acquaint themselves with the new fuels. This series of experiments were later known as the Mirak Program. The idea was to design the smallest possible liquid fuel rocket in such a way as to minimize both the expense and danger involved.

After a careful survey of all the available liquid propellants scientists discovered that a mixture of liquid hydrogen and liquid oxygen would be most powerful. Because, however, of hydrogen's extremely low boiling point and its tricky nature, it was substituted by gasoline. Thus the standard mixture of gasoline and liquid oxygen became the most dependable fuel for the rocket experimenter.

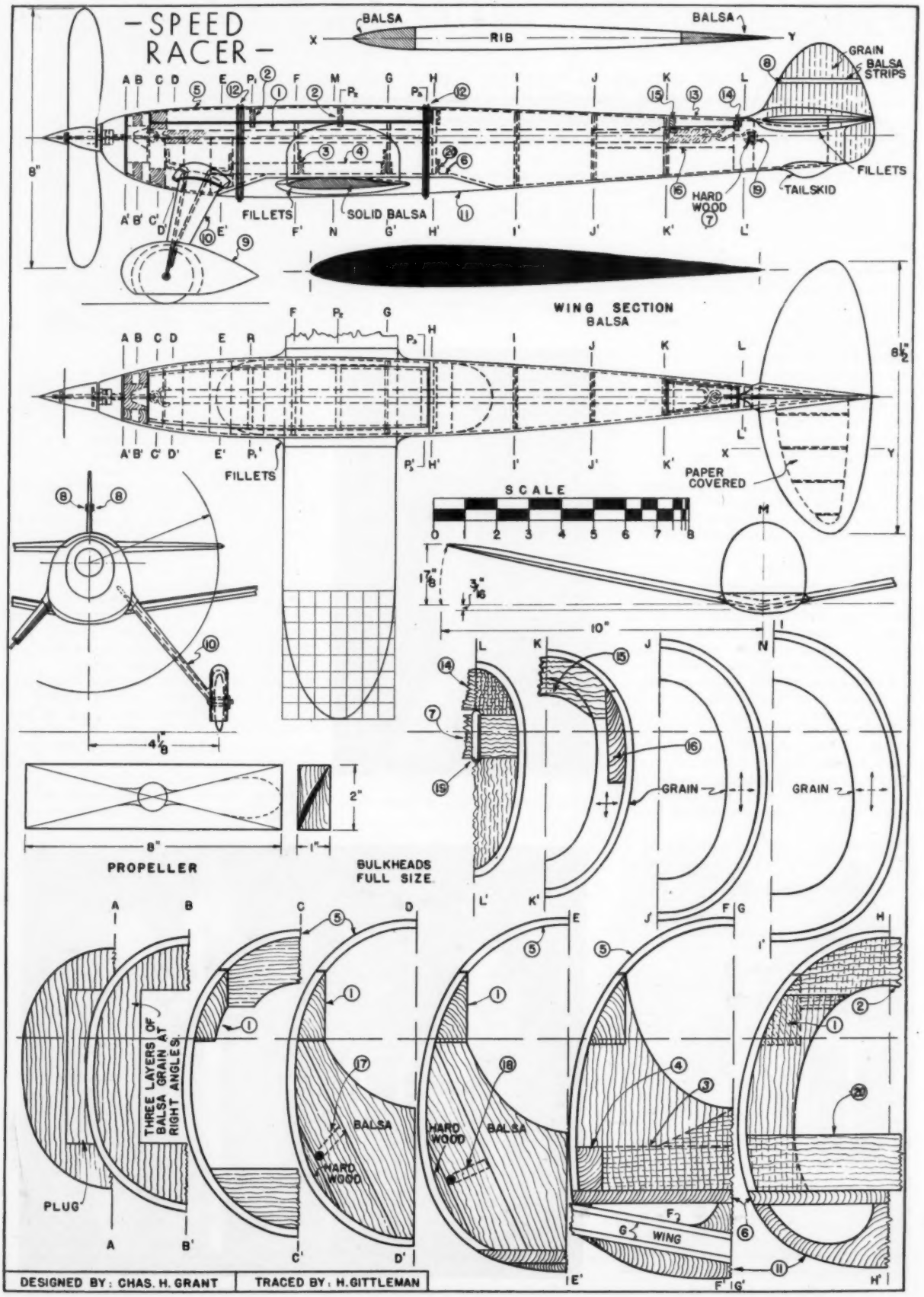
Among the first problems that confronted the Germans in their Mirak Program was the method of forcing the fuel into the combustion chamber. Although force pumps seemed to be the only solution, they were undesirable because of the excess weight they would add to the completed rocket. A much simpler method was discovered and the force pumps were

(Continued on page 30)



Interplanetary Step Rocket

Members of the Interplanetary Society firing a rocket at Manchester, England


-SPEED RACER-
BALSA
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GRAIN
BALSA STRIPS
FILLETS
TAILSKID
HARD WOOD
SOLID BALSA
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WING SECTION
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0 2 3 4 5 6 7 8
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GRAIN
THREE LAYERS OF BALSA GRAIN AT RIGHT ANGLES
PLUG
BALSA
HARD WOOD
HARD WOOD
BALSA
WING
DESIGNED BY: CHAS. H. GRANT
TRACED BY: H. GITTLEMAN

Designing Your Model for Distance

Why Distance Models Are the Most Difficult Type to Design and What They Should be like to Meet the Demands of High Performance

Article No. 61 By CHARLES HAMPSON GRANT Chapter No. 5

THE "day" of the so-called distance model appears to have gone, never to return. Perhaps this is due to the distaste that the average person holds for any unnecessary exertion. Obviously the very purpose of the distance plane is a flight, at the end of which it lands as far as possible from the starting point.

Such circumstances require the model to be returned to the starting point if another flight is to be made, especially if such flights are made in competition with other model fliers where more than one flight contributes to the advantage of a contestant. Probably the greatest disadvantage in flying for distance is the fact that it is necessary to measure the distance between the starting point and the point at which the model lands. This is not only inconvenient but requires valuable time. In a contest for distance the officials, of course, are required to measure and record this distance flown, so perhaps it is not due entirely to the lethargy of the model flier that distance flying has lost its popularity, but rather because the officials lack enthusiasm for physical exertion due to the ravages of advanced years.

However, in spite of the inconveniences presented by distance events, it is possible that this type of flight may become popular again through a normal evolution of the sport of model flying. Regardless of this, distance flying presents an interesting problem in model design and it is quite probable that many model builders will feel the urge to create this type of plane at one time or another during their model careers. It is imperative, therefore, that the important points in the design of distance models are outlined so that model builders shall not search in vain for suggestions that will aid them in carrying out such a project.

Two theories have existed concerning the proper procedure to follow in order to fly long distances. One is to design the plane to fiy long distances under the power of the motors, the plane attaining an altitude of not more than 300 feet, and flying a perfectly straight course with the wind from start to finish. After the power ceases, the plane is supposed to glide straight with the wind until it comes to earth.

The other is to design a plane that will climb to a great altitude with the power of the motors and the help of erratic but often helpful air currents or thermals. The model flier then depends on the altitude, the wind and excellent gliding qualities of the plane to carry it a great distance from the starting point.

Both methods have produced winning flights. However, long experience proves that models, designed according to the first theory of procedure, win more *consistently* than models that depend on the more capricious factors of wind and ability to remain in the air a long time without adhering to the virtue of flying a *straight* course. In other words, the second type of model is a typical duration model which is flown for distance. Occasionally such models have made remarkably long flights but in most instances they wander back and forth over the countryside, to land many times only a short distance from where they started. Some of them have followed the embarrassing procedure of heading into the wind and hovering at varying altitudes overhead until the power gives out. Fliers of such models have grown fat and lazy from lack of exericse. Model fans who have understood the secret of designing a straight flying model that would keep its nose "down wind" most often have won the distance contests. Of course it has been required at such contests that the model remain in the sight of the judges during the entire flight. Ambitious timers who were not loath to stretch their legs have turned in many winning "distances" to contest officials.

Qualities of Distance Plane

The only real distance model is one which is designed to follow the procedure set forth in case number one, in which the model flies a perfectly straight course. Now the question is, what qualities should a plane have in order to follow this procedure consistently? First, the model must be so designed that it will fly as straight a course as possible *before the wind*. It will thereby land at a point which is the greatest possible distance from the starting point.

Second, the propellers must continue to turn for a long period of time. This means that the propellers should turn as slowly as possible and the motors should have a capacity for many turns. It is important also that the model should fly as far as possible with every revolution of the propeller. Thus the turns stored in the motor will not be expended quickly.

Third, the plane should pass through the air with as little resistance as possible so that little power will be required to drive it, for the less power that is required to give the plane any specified performance, the smaller the propellers may be. In turn, the diameter of the motors will be kept down to a minimum and consequently more turns can be put into them. This is one of the

(Continued on page 32)

How to Build a Speed Model Racer

Here Is a Plane That Will Give You a Real Thrill

SEVERAL groups of model builders throughout the country have been extremely interested in speed model building and flying. Recently the number of these groups that have followed this phase of model aviation has increased enormously. This has been evidenced by many requests for plans of and data concerning speed models.

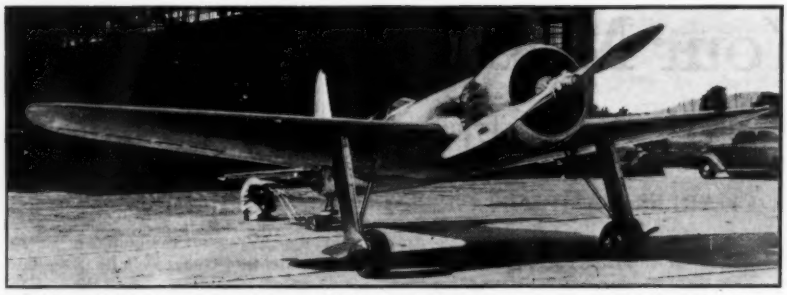
In the December, January and February issues of MODEL AIRPLANE NEWS the articles by Mr. Charles Hampson Grant discussed the designing of speed models. In these articles the outline of a design for a speed ship was given. Plans for this speed model appear herewith on page No. 6. Full details for completing the construction of this little ship will be found on the drawing. Further information which may ease the task of the builders follows:

The shell of the fuselage is to be hollowed out from a medium hard grade balsa block. The fuselage is made in two halves, left and right. After the hollowing out operation has been completed the bulkheads and internal parts of the model should be inserted in one half. When you are sure that everything is in its proper place the other half of the fuselage should be glued in position. You should be careful to cover all points of contact with the fuselage shell thoroughly with cement.

The parts, as indicated by the numbers on the drawing, are as follows:

1. A hard balsa longitudinal strip. 2, Balsa bulkheads which fit into the forward trap door at the top of the body. 3. A balsa cross-piece to strengthen panel F. 4. Longitudinal strips of balsa to connect and strengthen panels E. F. G. 5. The upper shell of the fuselage which forms the forward trapdoor. The removal of this enables the rubber to be inserted in the model. 6. A sheet of 3/32" balsa which forms a base plate for the wing mount block, No. 11. 7. A hard wood cross piece in bulkhead L, which is 3/16" x 3/4" in cross section. 8. Balsa strips running across the vertical grain of the fin, 1/8" x 1/16" in cross section. 9. Light balsa streamlining. (Suggested). 10. Hard balsa streamlining for the wire struts of the landing gear. 11. The wing mount block of light balsa. 12. Rubber bands which pass around the fuselage and which hold the wing mount block in its proper place. They loop around pins driven into this block on its underside. 13. Cover-

(Continued on page 26)



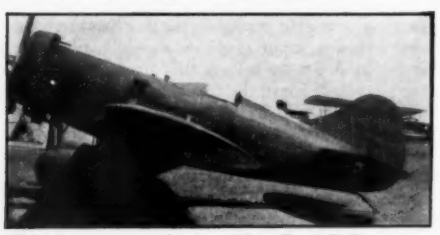
Howard Hughes' Racer that spanned the continent at 352 m.p.h. (Acme Photo)

Frontiers of Aviation

By ROBERT C. MORRISON

Highlights of the Paris Aviation Show and How American Planes Compare With Foreign Types

THE Grand Palais of Paris, France, recently exhibited in its spacious halls an array of the finest airplanes ever to be displayed in Europe. There were many surprises. The absence of Europe's favorites of just a few years back, those seemingly glorified versions of canal barges, was strikingly evident, and in their place was a great variety of swift, modern airplanes with the American "cut" but with much originality in design. Without doubt America is responsible for this sudden "spurt" toward swifter and cleaner designs. Lockheed, Boeing and Douglas have so well scattered their huge famous transports throughout Europe that the countries across the Atlantic have found it necessary to fight this stiff competition unless they want the United States to gain a monopoly of the air transport industry as it almost completely did in the automobile industry. At present Douglas DC-2s are now used in Europe on the K.L.M. Lines in the Netherlands, OELAG in Austria, Deutsche Lufthansa in Germany, L.A.P.E. in Spain, LOT in Poland, C.L.S. in Czechoslovakia, Avio Italiane in Italy, Swissair in Switzerland, and in the Orient on Japan Air Transport, China National Airways, and K.N.I.L.M. in the Netherlands Indies! And even now a large shipment of Douglas DC-3s are on their way to K.L.M. One of Britain's largest airlines has expressed the opinion that they may buy our Lockheed Electras. So you see the great nations of Europe have good cause to build speedier airplanes.



This is not seen often; a "Gee Bee" E Sportster of 125 hp. (P. C. Boisseau)

The Mexican owned Survey plane in the form of a Fairchild 82-A. (J. Williams)

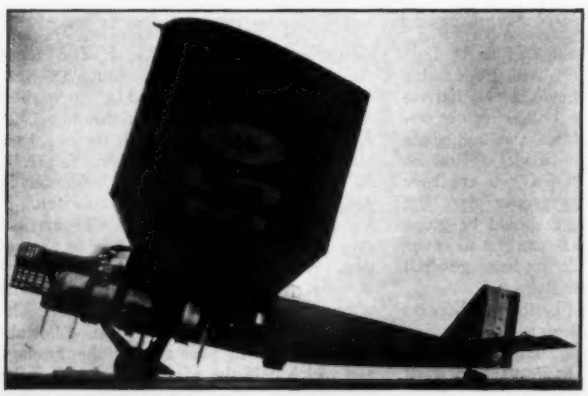
The new Fairchild 24C-86 with a 145 hp. engine. It is equipped with flaps. (Williams)

Though one usually has a smattering idea of what France, England, Germany and Italy are doing, the activities of the smaller countries go unnoticed by most people. However, one such country, the Netherlands, has become one of the strongest air transport powers in Europe with its famous K.L.M. line and at the aircraft show it displayed two of the most outstanding airplanes, those of Fokker and Koolhoven. The Koolhoven plane is rather radical and is what might be called the "perfect airplane" in that it has all its parts in the most efficient place. By that we mean that the engine, pilot and wing are as close to the center of gravity as possible, making the swift ship very maneuverable. The wing joins the fuselage directly at the line of thrust, affording the most speed. The fuselage belly hangs low to house the landing gear and give the plane stability. Two large propellers in tandem fashion at the nose of the fuselage turn in opposite directions to relieve propeller torque which is so troublesome on high speed airplanes. The pilot sits above the wing on top of the fuselage and has excellent visibility. Just below him is a V-12 Lorraine engine that connects with the two props by a series of very efficient gears. The engine, which is liquid-cooled develops 900 hp. and gives the small Koolhoven a speed of 325 m.p.h.! The plane has been designed for pursuit work and should be the fastest air fighter in the world. A machine gun is located in the leading edge of each wing panel and also one that shoots through the prop spinner.

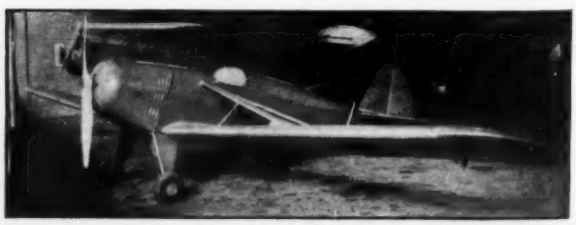
The landing gear of the Koolhoven retracts upward and outward with part of the gear located in the wing and the rest blending into the sides of the fuselage as on the Brewster Navy plane described in these columns a few months ago.

Construction is of wood with three-ply covering which is "skin-stressed." It has a span of 29 feet, 6 inches and weighs 3,630 pounds fully loaded. Lip-slot ailerons are used and seem to be located just aft of the first wing spar. This affords the entire trailing edge of the wing for flap area.

Painted scarlet and yellow, Anthony Fokfer's latest creation was one of the most



The new Farman 201 which has a speed of 200 m.p.h. and carries 4400 lbs. of bombs. Range is 1250 miles. (Globe Photo)



The latest addition to the Ford engine powered field, the Arrow low wing sport plane

The new 10 man giant North American bomber "Dragon," said to be the most formidable ship of its type in the world. (International Photo)

colorful airplanes of the show. It is known as the G-1 (apparently Mr. Fokker is starting from scratch again). The tail is on booms which trail the two radial engines of Bristol make. The crew is enclosed in a well-designed nacelle in the center of the wing, and here is also kept the bombs and other slaughter equipment for, as is everything in Europe, the G-1 is a military plane. Four machine guns are located in the nose of the nacelle and one in a gun turret at the rear. The airplane is well designed throughout and we were pleased to see that American Hamilton controllable props are at its nose.

While America is too far from France to make it worth while to ship some planes to the show, Germany, who is one of France's closest neighbors was also conspicuously absent. The German aircraft industry is so busy building airplanes that they had no time to put any in the Paris show. It is a known fact that Germany is producing airplanes almost on a mass production basis. The Junkers Company for example can now produce about six planes a day of their new twin-engined type. This model is being built both as a transport and a bomber. Though the Junkers, that well known JU. 86, may be considered an excellent plane at the present time, it is likely to be outmoded within a few years because of the fast development of modern airplanes, and Germany will have a huge number of almost obsolete airplanes on her hands. Most of these ships are depending on Diesel engines for power plants and have already seen wide use.

Great Britain exhibited her new mid-wing Blenheim bomber. We would perhaps call it a light bomber in this country. It has very clean lines and is of the conventional twin-engined design. The Hawker Hurricane, England's present pride and joy, was unfortunately not permitted to be shown. It has one of those new Rolls-Royce Merlins in its nose and has a phenomenally fast speed. A low-wing single-seater, it should do all that is expected of our new Seversky.

Russia was a very outstanding exhibitor at the show. One of their planes was a transport much like our Douglas DC-2, though the workmanship was not as good. Then there was a sleek single-place low-wing pursuit plane which might be mistaken for the English Spitfire. The fighter is known as the Z.K.B. 19 and the transport ANT 35. They were both fine airplanes and showed that Russia has not just been "toying" but that there are some well-informed Russian aeronautical engineers.

With the exhibit being staged in Paris, France was of course the most represented. The Caudron concern had all their wares to show which included the Goeland, Typhon, Aiglon, Pelican, Rafale and Simoun. They all look like each other. Detroyat's was there too.

Farman had the largest plane on display, a huge four-engined high-wing 40-passenger monoplane which reminded one of futuristic architecture—its "lines" going in every direction. Farman is known for his radical airplanes though this one probably takes the "cake." It has a nice appearance though we think it will be very slow. There is no necessity for great speed as the plane will be used by Air France across the English Channel. There is probably enough room in the fuselage for each passenger to tote his own canoe in case they should make a forced landing in the channel.

About the only other plane like it was the old Fokker four-engined F-32. It is all-metal except for the trailing edge of the wing and controls which are fabric-covered. The engines are Gnome-Rhones of 800 hp. each.

It is a joy to look at the new Amiot twin-engined bomber, a rather small ship like the Bristol Blenheim. A glass-enclosed gun turret was in the nose much like that on our huge Boeing 299 bombers. The well-streamlined pilot enclosure on top the fuselage was offset to one side so as to permit the gunner in the front turret to go to the rear of the plane without interfering with

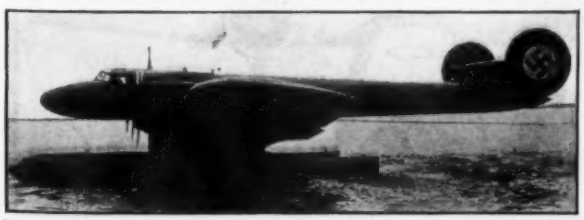
(Continued on page 36)

The Waterman W-1 variable dihedral plane. What next? (Williams from Mitchel)

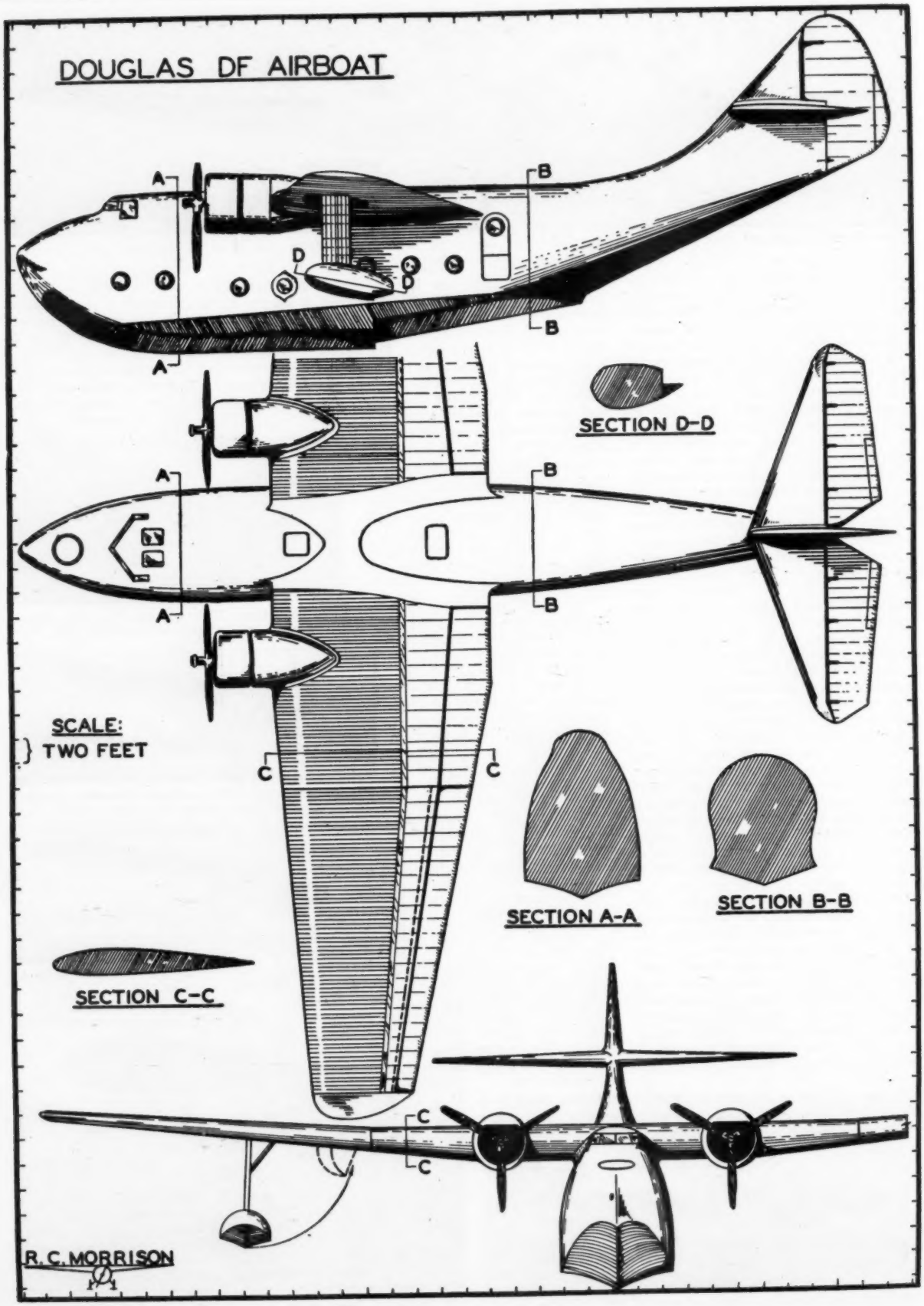
The Brown Young BY-1 built by Columbia Aircraft Inc. of Tulsa, Okla. (By Gilmore)

The Norduyn Norseman powered with a P & W engine. (Williams from Kuster)

Al Williams' latest plane, a Grumman G.G. 2 powered with a 935 Cyclone engine. (By Harold Martin)



The Lufthansa flying boat built for transatlantic service. It has four motors and weighs 16 tons. (Acme Photo)


DOUGLAS DF AIRBOAT
A
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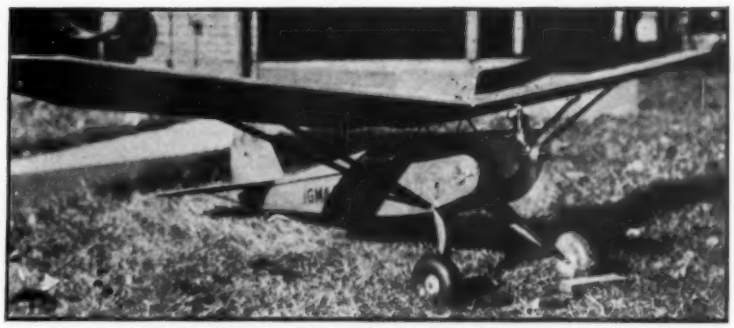
R. C. MORRISON

A Timer for Gas Models

How You Can Regulate the Flight of Your Gas Model

By HARRY E. MOYER



The author's model equipped with a flight timer

HOW many times have you gas model fliers had the sad experience of doing a marathon race over two counties to retrieve your model? Then if you were lucky enough to find it at all, the fuselage was probably in the top of a tree, the wing on the ground some distance away, and the model a complete washout.

Or did the airport manager who kindly let you use part of the field the week before, provided you stayed in a certain area with your flights, say, "Sorry, but not today. Remember what happened last week."

Similar experiences caused the writer to develop a device to control the length of the flight of a gas model.

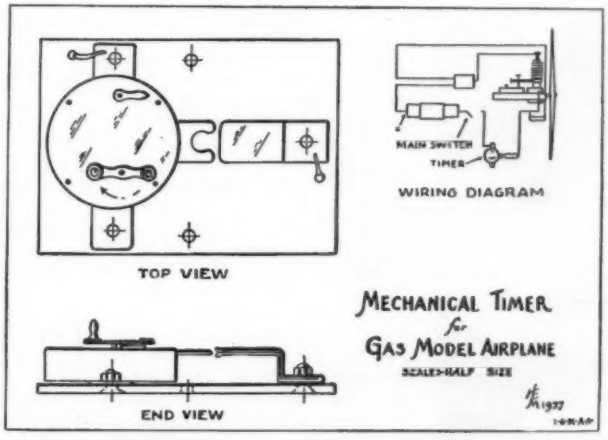
Various devices were tried, such as graduating the fuel in an eye-dropper (which was very unreliable) propeller-driven cut-off switches, and, finally, photo self-timers, both bellows and wind-up type.

The wind-up or mechanical type was found to work best and has been used successfully by the writer for over a thousand flights.

These photo self-timers can be purchased at camera stores in most cities for about $2.00.

The timers are manufactured in two styles, round and rectangular, with a mechanism similar to that of the watch. They can be set to operate from forty seconds to zero, or can be locked by dropping a latch provided for the purpose. The weight is about 1¾ ounces.

To make the timing switch, you will need one photo self-timer, which will be referred to as the positive timer unit; one piece of plywood or fibre 3½" x 2½" x ⅛"; one piece of .020 sheet brass 8" long and ½" wide; three flathead 6/32" machine screws ⅜" long, with nuts; a small hand drill and a ⅛" twist drill; one soldering iron; a pair of pliers and a pair of snips or shears.



Construction

The construction is very simple and can be completed in a few hours. Follow the diagrams carefully.

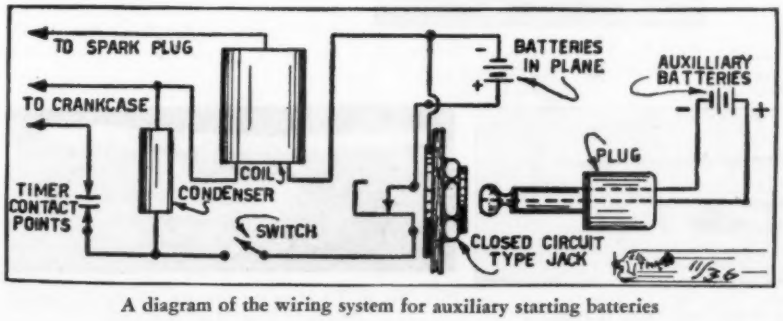
On the timer unit, solder a brass strip ½" wide and long enough to extend ½" beyond each side; drill ⅛" holes in this brass as marked on the

(Continued on page 35)

A Wiring System for Starting Batteries

By H. G. SIMPSON

BECAUSE the flashlight type batteries used for supplying the ignition current to gas model engines have a limited life in service which sometimes causes them to fail to give proper operating current at a critical time in the flight of a model, some operators use an auxiliary set of the regular "dry-cells" to provide the necessary current for operating the engine during the testing or warming up of the engine before flight. This circuit, when properly wired, has the effect of cutting out of the circuit those batteries which are carried in the plane and placing the load upon separate batteries which are connected to the ignition circuit through a radio-type plug and jack arrangement. At the same time, the proper circuit arrangement will permit this to be done without any interruption of current flow to the ignition circuit, stopping of the engine or short-circuiting of the batteries carried in the plane.



A diagram of the wiring system for auxiliary starting batteries

Since the circuit involved may appear somewhat complicated to some builders, I am outlining here the circuit that will give the proper electrical connections, the location of the various parts of which are left to the builder's choice and convenience in their use.

In wiring the circuit, any type of plug that will fit the radio-type jack may be used. For a jack, there are a number of models which can be secured at any radio supply source but, because of its small size and light weight I have used what is known as the Carter No. 2-A. This jack has a metallic body part with a lock-nut arrangement for fastening it in place and two contact springs, all three of which are electrically insulated from each other. This is a necessary feature for the proper circuit arrangement.

(Continued on page 26)

"Gas Lines"

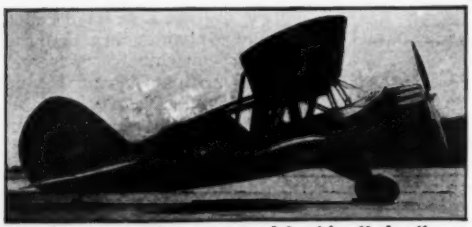
Latest News of Members of the International Gas Model Airplane Assn. From All Parts of the World

The I.G.M.M.A. Pin

Pict. No. 1. This is not a large ship but just a "gas" model by Elbert Weathers

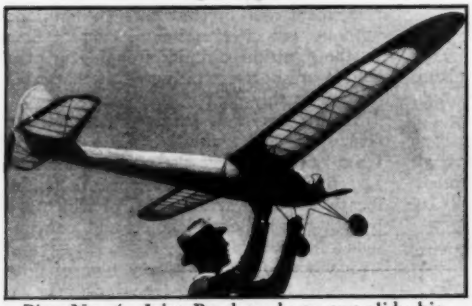
AS ONE reflects on the progress made in gas model aviation he cannot help but be astounded. It is a long jump from Maxwell Bassett's ship which he flew in the 1932 "Nationals" at Atlantic City, New Jersey, to the model which are being built by hundreds of young men throughout the country today.

Because these miniature gas engine power plants are similar in form to those used in big ships, scale models with these engines can be built which fly fairly well. The characteristics of such models also lend themselves to realism. The proportions and many details of the big ships may be accurately followed. Present gas models evidence great thought along the lines of exactness to scale and details of construction. Many are very beautifully finished and great advances in the construction of these ships have been made. Naturally new forms of structure have had to be developed as greater weights and greater speeds are involved, so we find metal has been used more extensively and balsa wood is giving way to hard wood in many cases.



Pict. No. 2. A Waco gas model with all details to exact scale, by M. W. Collins. It flew out of sight, but was recovered

Pict. No. 3. A speedy 52 inch gas model of "Mr. Mulligan" by Wm. Slaughter and S. Capron. It weighs 3½ lbs.



Pict. No. 4. John Pond ready to test-glide his "Cavalier" gas model. It weighs only 4½ lbs.

Pict. No. 7. Mrs. C. H. Stagg of Phila., Pa., and the gas job she constructed

Pict. No. 5. Three gas jobs at the Omaha, Neb., Unit No. 19, contest. Left to right they belong to E. R. Lane, Fred Wilke and Dick Watt

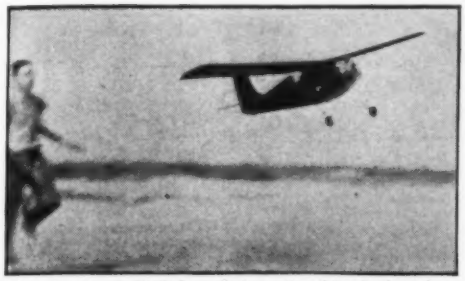
Pict. No. 6. Ed Manning first gas job before it was covered. It is "Elf" powered

However, though there has been great advancement in construction, which is a quality that may be recognized by the "eye," the advancement in design has not kept pace with it. Qualities of design cannot be SEEN but must be UNDERSTOOD. One might say that they must be visualized by the brain itself in an abstracts form. Naturally this is more difficult. At the present time there are very few machines which do not possess some fault in the make-up of their design. True, many excellent flights are made by these ships but these flights are of such character that the fault in the design does not become evident always. On other flights, however, which these machines may make and in which the machine encounters peculiar flight attitudes or conditions, design faults immediately make themselves evident.

In other words, to have a consistently stable flier the design must be perfect. Is it not time that gas model builders cease to doggedly persist building certain types of ships which look well but which are inherently faulty? With a little careful thought and study on the problem of stability and design layout of their planes, many bad qualities may be eliminated from models.

One of the most glaring errors that is being made at the present time consists in building a scale gas job, that is true to scale in all respects to the big ship, up to the point where the dihedral is put into the wings. Here the model designer throws his good sense to the winds. He does not follow the wing set-up of the big ship but proceeds to increase the dihedral considerably in order to insure a degree of lateral stability which must necessarily be high in a model. By doing this he "upsets the apple cart" of all the flying stability factors.

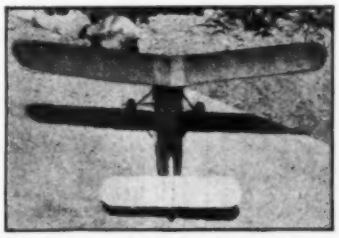
In the first place he raises the center of lateral area, (directional center) above the center of gravity, which will tend to make his plane spiral dive. This form of instability will not usually be noted on all occasions but only under certain conditions. On one flight it flies satisfactorily and under other conditions it spirals into a crash. Such things do not "just happen." There is a very definite cause for it and it is usually the improper RELATIVE POSITION of the *directional center* and the *center of gravity*. The center of lateral area, (directional center) approximately, should be on a horizontal line with the



Pict. No. 8. J. R. Edwards launches his Corben for an "out of sight" flight of 13 minutes

Pict. No. 10. A Brown powered five foot model built by Fred Pilcher Jr. It weighs only 2¾ pounds. The motor is inverted

C.G. In cases where the dihedral is increased in building a scale model, a compensating amount of area should be added below the C.G. This may be done by increasing the size of the wheels, fairing in the landing gear struts or bellying down the body. Model builders often lower the C. of L.A. by dipping the line of thrust. This brings the rear end of the fuselage lower than in cases where the line of thrust is parallel with axis of the fuselage.



Pict. No. 9. It is hard to believe, but this is an "Elf" powered KG-3

Pict. No. 11. Gene Stephens' 10 foot KG-3 taking off in a steady climb, driven by a Forster Bros. engine

We trust that in the future all gas model builders and International Gas Model Airplane Association members in particular, will give serious thought to the problem of *designing* their ships *before* they attempt to *build* them.

Now we wish to present some very interesting contributions in the form of pictures and news from our members. We feel that the outstanding model, picture of which has been sent to us this month, is the one shown in picture No. 1.

It was built by Elbert J. Weathers of 2720 Poinsettia Drive, San Diego, California, and certainly has a most realistic appearance. One of the interesting features is the cowling around the engine which raises up on either side so that the engine may be properly inspected and adjusted. This model is powered with a Bunch Mighty Midget engine. Mr. Weathers says:

"Time was disregarded completely in designing and building, and I believe it will be of interest to know that Mr. Grant's articles were utilized as much as possible in completing the design. I am more than pleased with the results obtained through the use of many of the fundamentals included in past issues of this series."

The machine is equipped with a G-3 airfoil, such as is used on the KG model. This gives it a steep climb and a flat glide. It may be of interest to note that all the items which were purchased for its construction totaled $17.09, excluding, of course, the engine; also the wheels and the camera timer. Some of the interesting specifications of the ship are as follows:

Wing span, five feet; wing chord, 8¼ inches; wing area, 442.42 square inches; wing loading, 1.2 pounds per square foot; aspect ratio of wing 7½ to 1; overall length, 4 ft., 1¼ in.; stabilizer span, two feet; stabilizer area, 30.34% of wing area; fin area, 8.47% of wing era; tread, 1 ft., 2 in.; dihedral, six degrees; airfoil, G-3; propeller diameter 1 ft., 1 in.; propeller pitch 8½ inches; moment arm, 52% of wing span; flying weight 3 lbs., 14 oz.; power plant, Bunch Mighty Midget; cowl, 4¾ inch diameter (metal); timer, "Autoknips" (German-made camera timer) Chrome case, size ⅜"x11/16"x1½".

Pict. No. 13. The Westchester Gas Model Club's neatly built KG-3 powered with a Forster engine

Weathers says further:

"Our I.G.M.A.A. unit, No. 27, is planning a big contest for April 4th, 1937. It is to be of the precision type and entries are expected from all over southern California." We understand that this meet will be sponsored by the I.G.M.A.A. and therefore any contestant may fly for the permanent I.G.M.A.A. duration trophy which is now held by Maxwell Bassett and was won with a flight of 23 minutes, 18 seconds. In this event 1/16 ounce of gas should be used for every pound of weight. The contest will be held at the Camp Kearney Mesa, near San Diego.

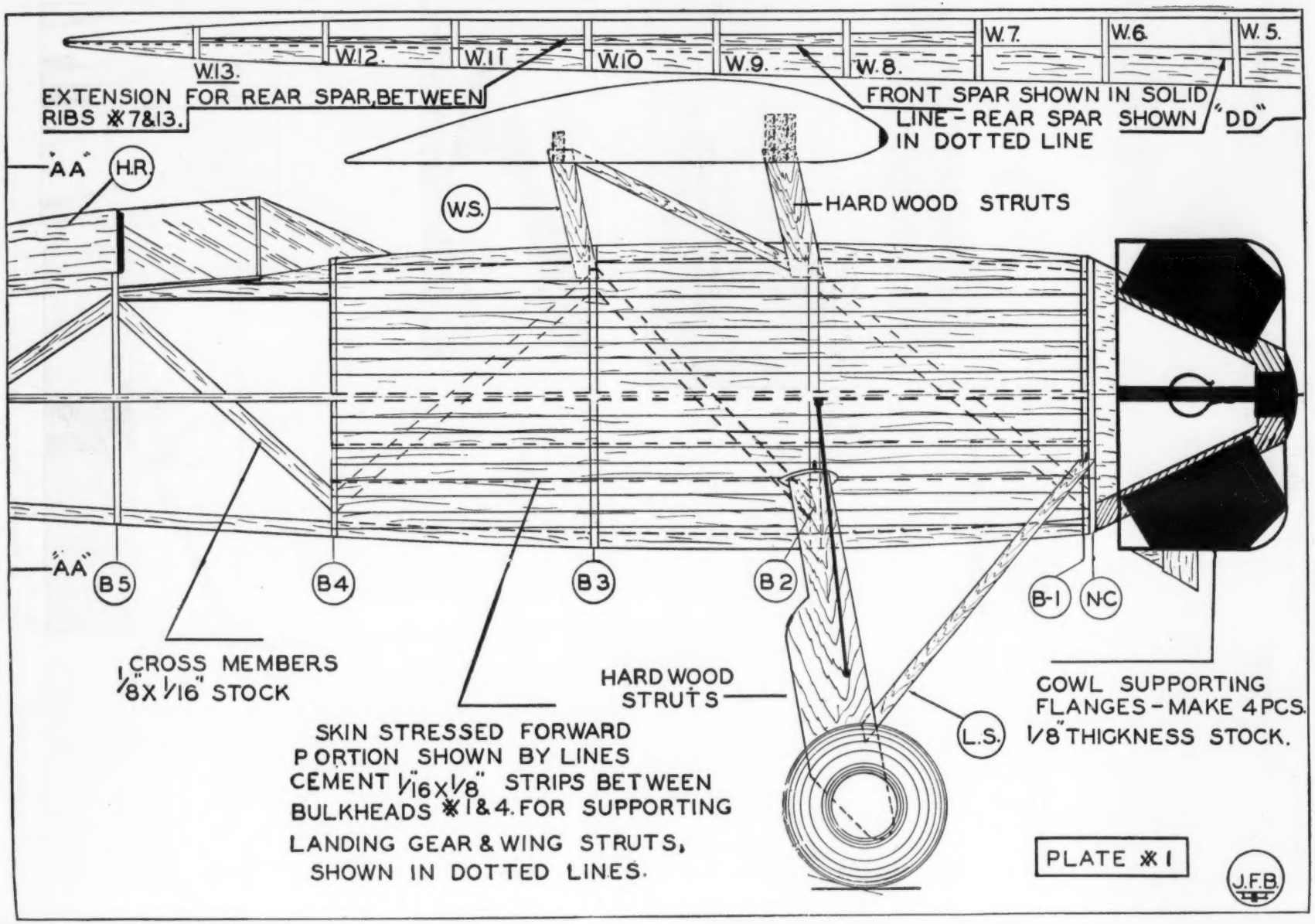
Pict. No. 12. A realistic six foot model by James Smith of Chattanooga, Tenn.

One of the most active and enthusiastic gas model fans on the west coast is Mr. M. W. Collins of 11161 Alder Avenue, Roscoe, Calif. He has been an instructor of model airplane building for the past ten years and is therefore in a position to know his airplanes. Recently he completed a very beautiful scale gas job of a Waco cabin plane. It is shown in picture No. 2, and

(Continued on page 40)

Pict. No. 15. S. Ditchburn and his 10 foot gas job "way down" in Australia. Look at that flat flying country!!

Pict. No. 14. This KG-3 made monkeys out of its builders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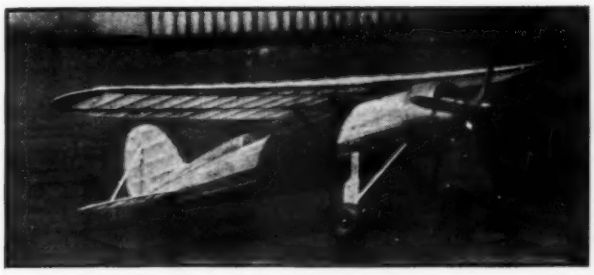
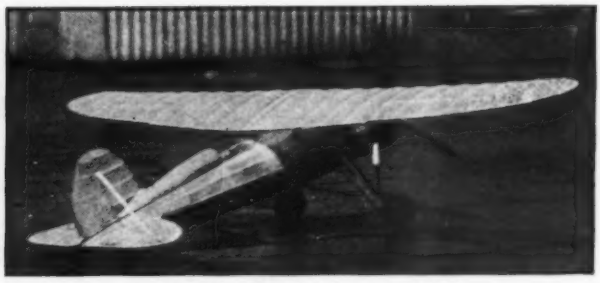
EXTENSION FOR REAR SPAR, BETWEEN RIBS ✱7&13.
FRONT SPAR SHOWN IN SOLID LINE - REAR SPAR SHOWN IN DOTTED LINE "DD"
"AA"
H.R.
W.S.
HARD WOOD STRUTS
"AA"
B5
B4
B3
B2
B-1
N-C
CROSS MEMBERS 1/8"X1/16" STOCK
HARD WOOD STRUTS
SKIN STRESSED FORWARD PORTION SHOWN BY LINES
CEMENT 1/16"X1/8" STRIPS BETWEEN BULKHEADS ✱1&4. FOR SUPPORTING LANDING GEAR & WING STRUTS, SHOWN IN DOTTED LINES.
L.S.
COWL SUPPORTING FLANGES - MAKE 4 PCS. 1/8" THICKNESS STOCK.
PLATE ✱1
J.F.B.



A trim craft of exact scale proportion



A completed model is very realistic

A Flying Consolidated Fleetster Model

How You Can Build and Fly an Exact Scale Model of a Famous Transcontinental Mail Plane

By JOSEPH BATTAGLIA

HERE is a ship with which lots of you fellows must be familiar. It came out in 1933 as Transcontinental and Western Airlines' mail and passenger carrier and was used on their western run until the department of commerce decided not to allow the air lines to carry passengers in single-engined ships. It has since been replaced by multimotored ships and has become more or less obsolete, but the Fleetster will always be known for its clean lines and the faithful service it rendered to the air lines and private owners who used it.

Before you start working on this job it is advisable that you study the drawings carefully, then get all the required materials as described in the "Materials List" after which you should be ready to tackle the job at hand.

Let us assume you have done as suggested above. You are now prepared to start work. The first step would be to match the drawings and trace all the templates of the ribs, bulkheads, etc., onto tracing paper, then transfer them to Bristol board or cardboard.

This done, cut them out and trace the outlines of each onto balsa or the type of material prescribed in the list. Now cut out each component part and as you finish them, place them aside.

The parasol wing gives it excellent stability

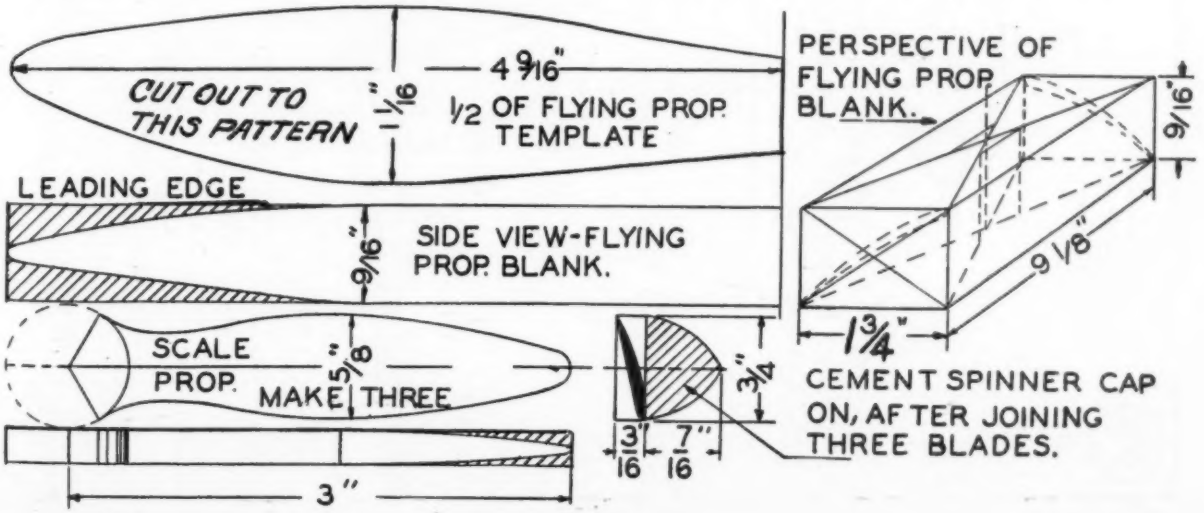
Take four strips of balsa 1/8" x 3/32" x 13"; placing them on the side view of plans, mark the bulkhead stations on each piece. These will represent the longerons, so place them on the bulkheads opposite each other.

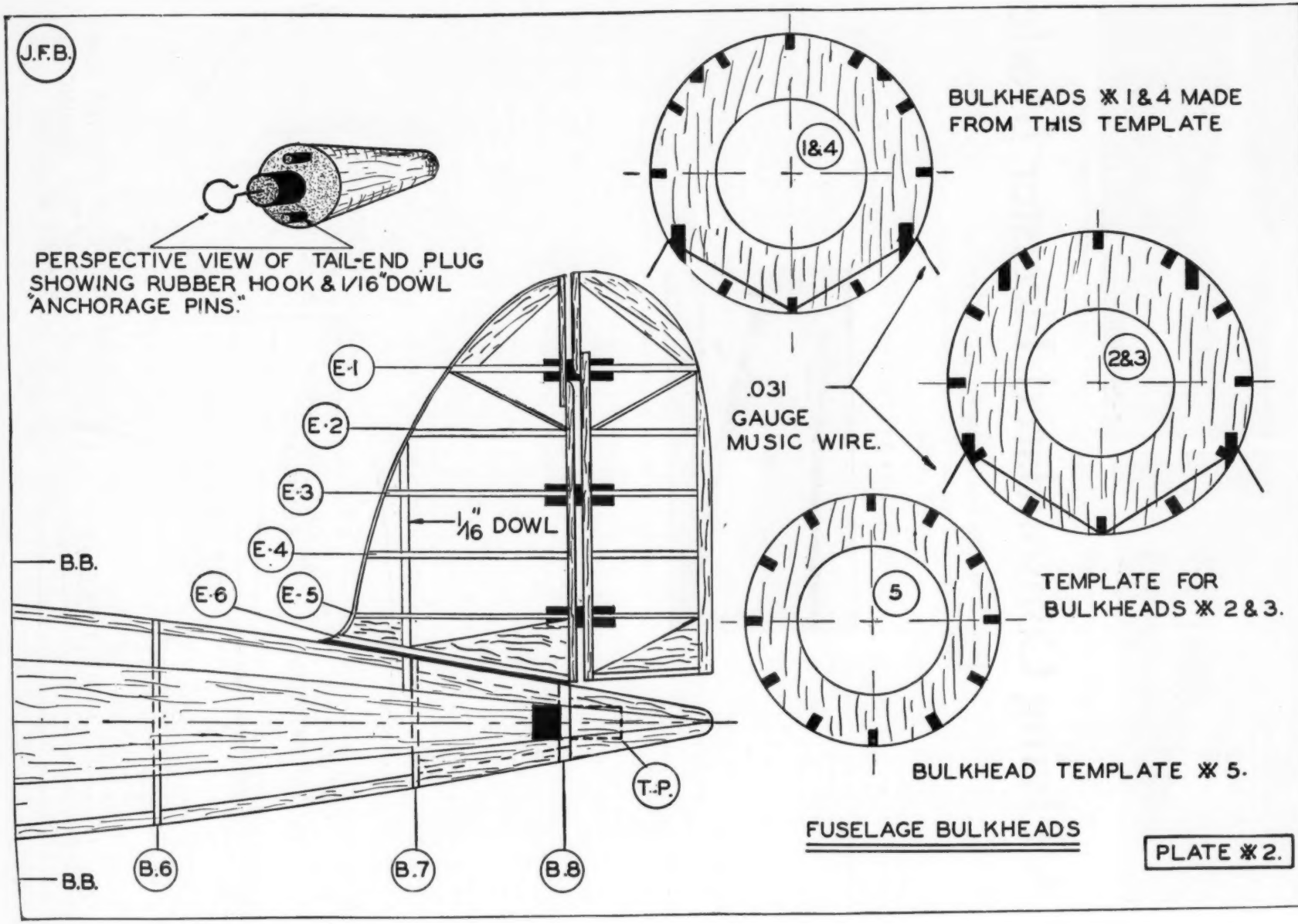
First cement the top and bottom strips in their respective places to each bulkhead. Allow the cement to dry, then fasten in the side longerons. Next fasten the four pieces which form the landing gear and wing strut braces extending between bulkheads 1 and 4 (shown in dotted lines). This done, place in all the other strips, cementing each firmly (the latter pieces forming the stringers). Now place in the compression members, marked (C.B.) cementing each in firmly.

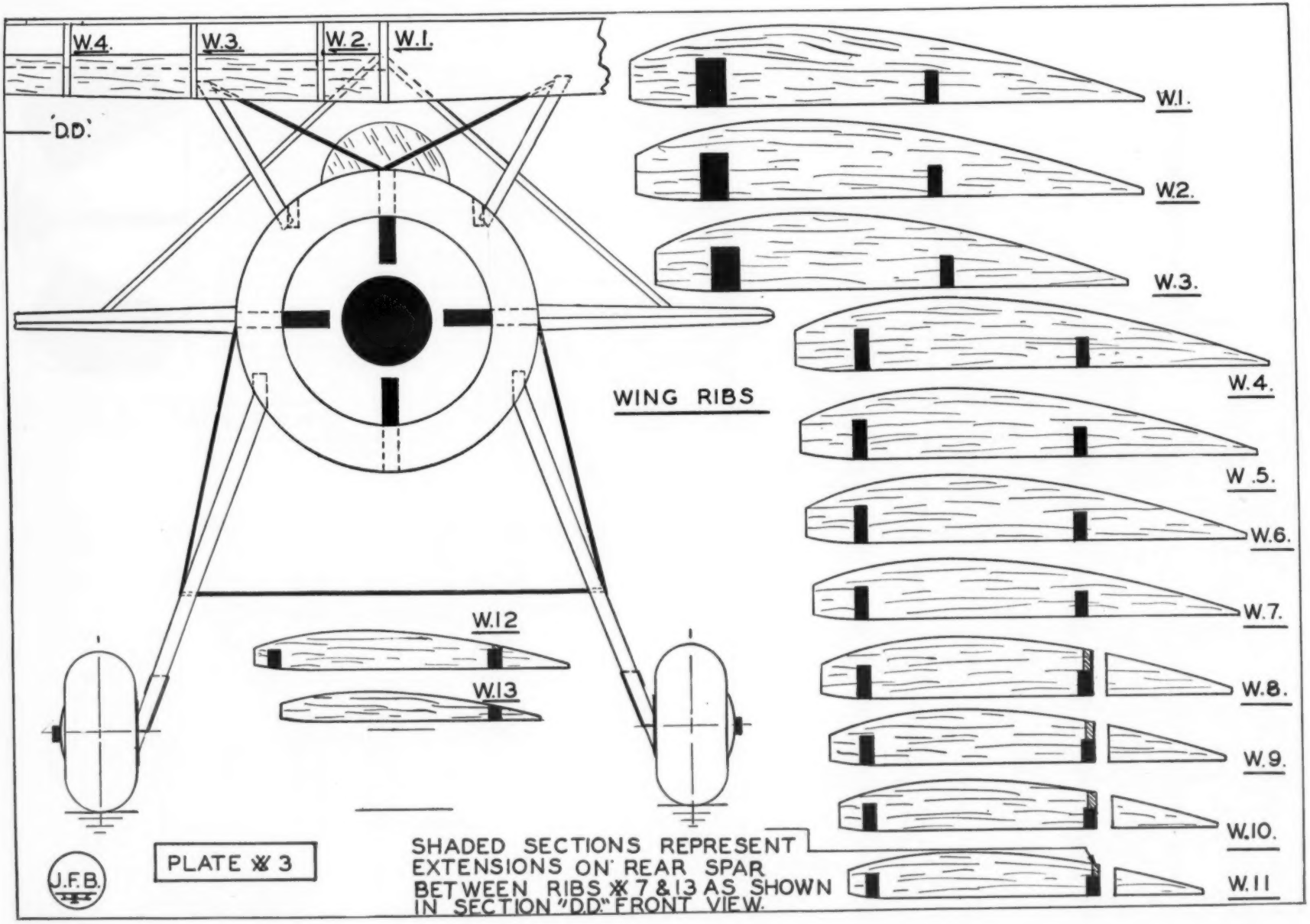
While the cement dries, make the shock absorber springs, (shown on bulkhead templates 1 and 4, 2 and 3). Make one each for bulkheads 1 and 2 as shown and cement in place firmly. You will notice that between bulkheads 7 and 8 there are cemented four pieces of balsa. These pieces are placed in to fill the spaces between the four longerons and strengthen that section of the fuselage onto which the tail sections are fastened. You will also notice that these pieces are drawn in dotted lines between the four longerons on the templates of bulkheads 7 and 8. These are to be made from 3/16" thickness stock. Cut them to the right shape and then cement them in place.

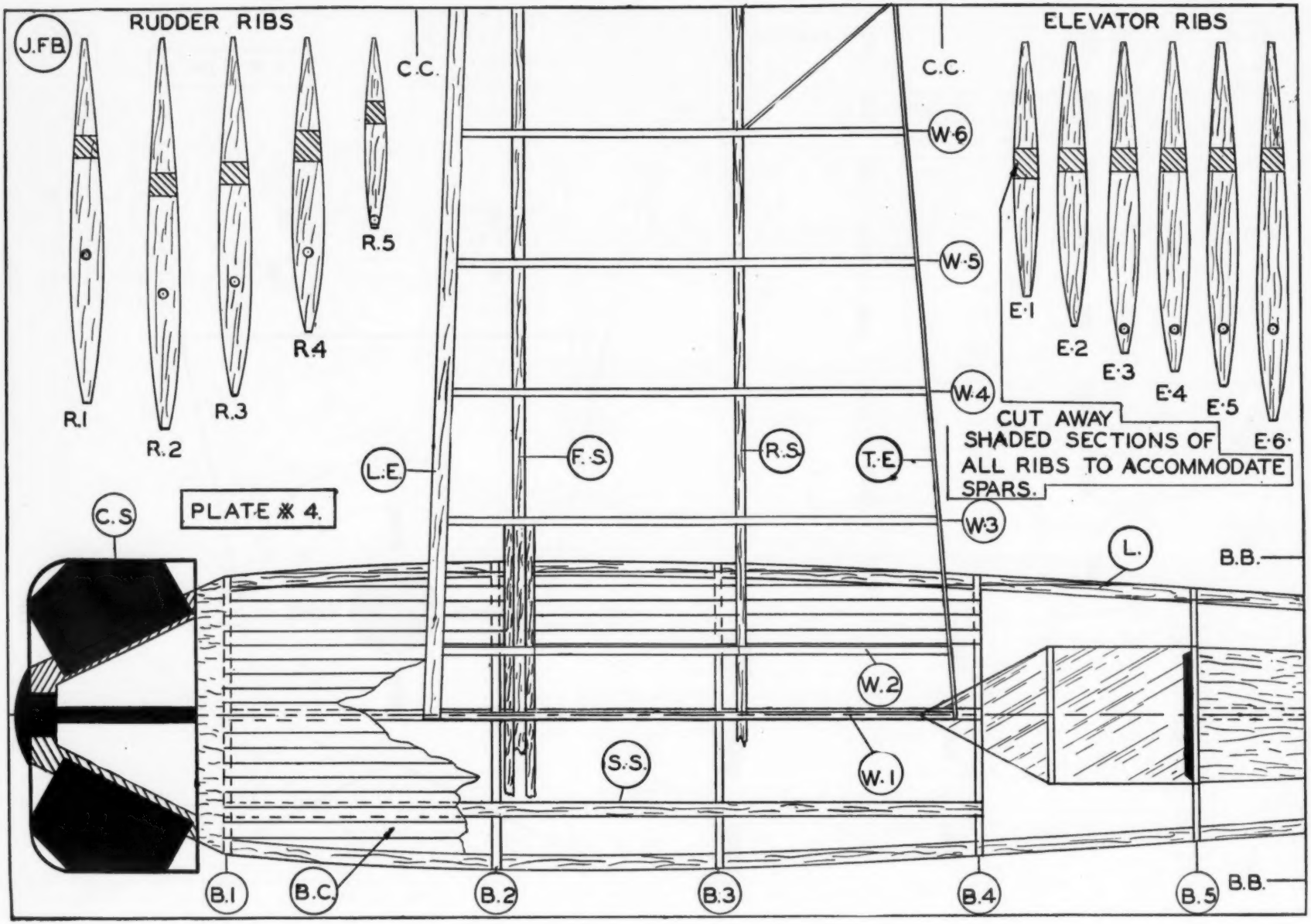
The next step is the nose cone and tail end plug. It is best to spin them on a lathe, but should you be unable to get the use of one, you can build them up in two halves. The nose cone is hollow as described in the cross-section views, shown in side and top views of drawings. Make it as shown then drill a 5/16" hole at the front end for the

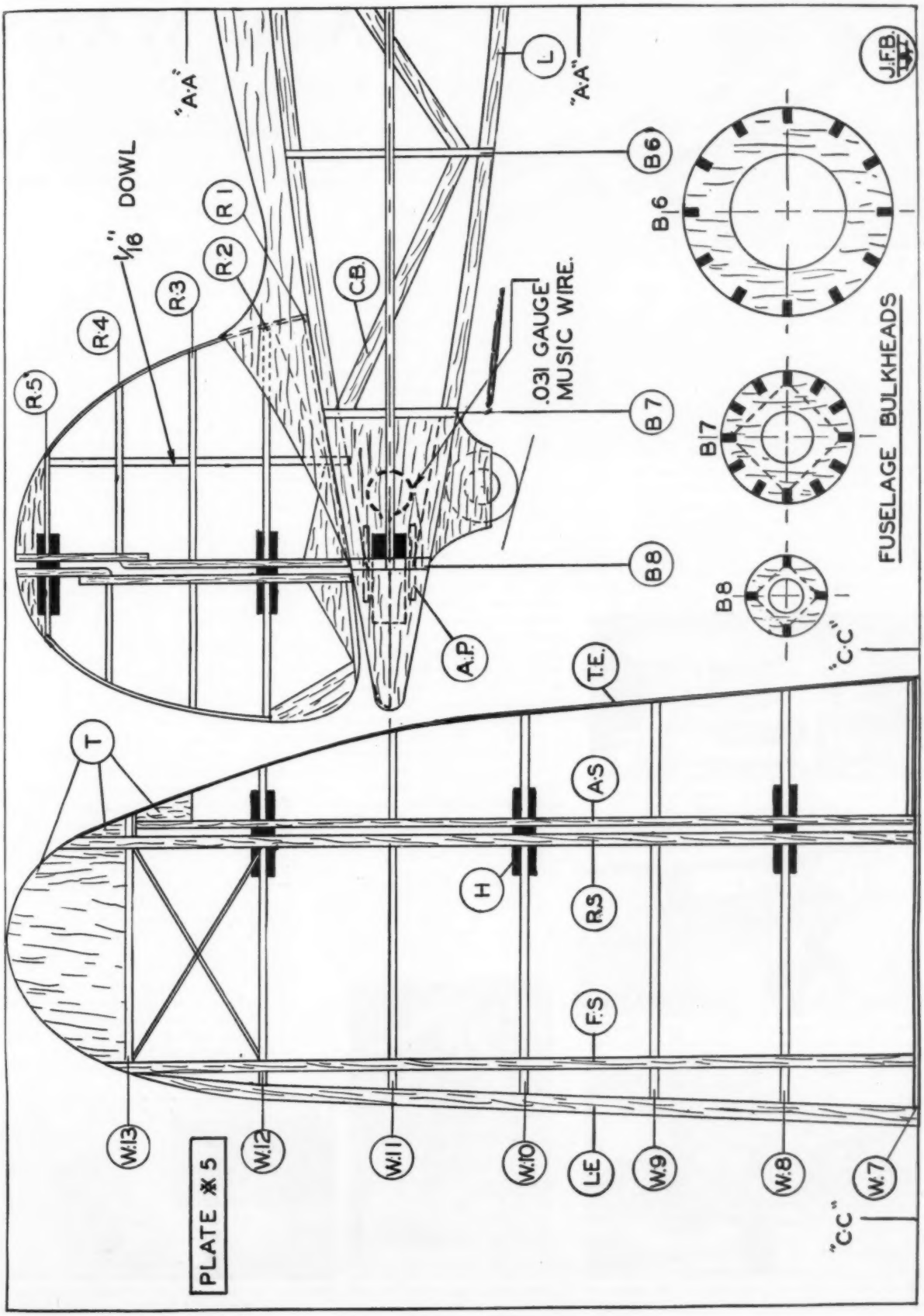
(Continued on page 45)

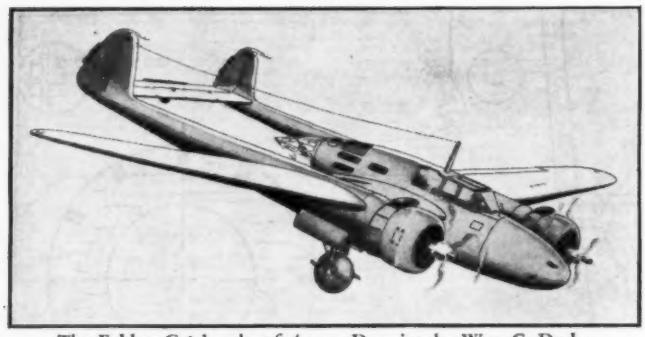



J.F.B.
PERSPECTIVE VIEW OF TAIL-END PLUG SHOWING RUBBER HOOK & 1/16" DOWL "ANCHORAGE PINS."
BULKHEADS ✻ 1 & 4 MADE FROM THIS TEMPLATE
1&4
.031 GAUGE MUSIC WIRE.
2&3
TEMPLATE FOR BULKHEADS ✻ 2 & 3.
5
BULKHEAD TEMPLATE ✻ 5.
E-1
E-2
E-3
E-4
E-5
E-6
1/16" DOWL
B.B.
B.B.
T.P.
B.6
B.7
B.8
FUSELAGE BULKHEADS
PLATE ✻ 2.


W.4.
W.3.
W.2.
W.1.
D.D.
W.1.
W.2.
W.3.
W.4.
WING RIBS
W.5.
W.6.
W.7.
W.8.
W.9.
W.10.
W.11
W.12
W.13
J.F.B.
PLATE ✕ 3
SHADED SECTIONS REPRESENT EXTENSIONS ON REAR SPAR BETWEEN RIBS ✕ 7 & 13 AS SHOWN IN SECTION "D.D." FRONT VIEW.


RUDDER RIBS
J.F.B.
R.1
R.2
R.3
R.4
R.5
C.C.
ELEVATOR RIBS
C.C.
E·1
E·2
E·3
E·4
E·5
E·6
CUT AWAY SHADED SECTIONS OF ALL RIBS TO ACCOMMODATE SPARS.
W·6
W·5
W·4
W·3
W·2
W·1
L.E.
F.S.
R.S.
T.E.
L.
B.B.
C.S.
PLATE ✻ 4.
S.S.
B.1
B.C.
B.2
B.3
B.4
B.5
B.B.


"A-A"
1/16" DOWL
R1
R2
R3
R4
R5
C.B.
.031 GAUGE MUSIC WIRE.
L
"A-A"
B6
B6
J.F.B.
B7
B7
B8
B8
"C-C"
FUSELAGE BULKHEADS
A.P.
T.E.
A.S
R.S
F.S
H
T
W.13
W.12
W.11
W.10
L.E
W.9
W.8
W.7
"C-C"
PLATE ✕ 5



The Fokker G.1 bomber fighter. Drawing by Wm. C. Drake

AIR WAYS

HERE AND THERE

What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Tell Others What You Are Doing

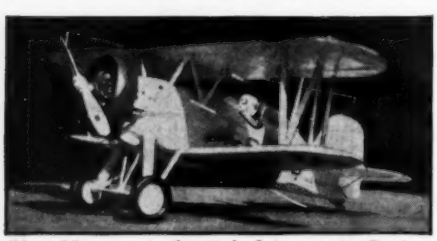
THIS is the time of year that model builders pull out their old ships from the moth-balls and dust off the spare parts that have been put away in the cupboards of their workshops, so that they will not be caught napping without an efficient model to fly during the spring and summer contests. Many builders may not realize it but it is true that during the winter months they have been storing away various ideas which they will put into practice when the good flying weather sets in.

Unquestionably during the coming season many new and startling, if not efficient, ideas will present themselves in the forms of various types of planes. At present there appears to be a tendency to think in terms of fast climbing, short motor run duration planes instead of the old large and slow turning propellers. Smaller, faster props, giving a greater thrust, are favored. The idea is to get the model up to a great altitude quickly so that soaring qualities may manifest themselves.

The exact nature of the modifications of the duration ships for the coming season is not entirely known. However, your editor wishes to predict that tail planes will be made slightly smaller. Upon the first realization that large stabilizers and fins were helpful to the flying of the model, the model builder, as in many other cases, exaggerated these qualities in his ships far beyond the limit of good taste and efficiency. It is about time that a reaction from this set in and that the area of tail planes will shrink to a more efficient size. By this we do not mean that small tail planes should be used. Large tail planes should be used, but not too large, for if they are excessive in size the advantage obtained is not such that it will overbalance the added weight and drag that would occur.

A very dramatic example of the ideal ship is Mr. Judge's ship. This young man came from England to "walk away" with the Wakefield Trophy. He was perfectly well aware that large tail planes were an advantage; however, he did not go to extremes in the matter, and had a moderately large tail; not too large, but sufficient. The efficiency of his ship was phenomenal.

The Air Ways Club is looking forward to seeing some of its members "crash through" in the coming contests and uphold the honor of the association.



Pict. No. 1. A detailed flying scale Boeing F4B-4, by Blake Arnold, Jr.

Pict. No. 2. A neat flying scale Vought. Realism is added by the (dummy) man spinning the prop

Pict. No. 4. Edward Jahn's dad in his glider in 1910, which he built and flew in the "early days"

Pict. No. 3. Charles Twichell and some of his models. The large one is a CO-2 gas motor job

Air Ways Club News

To prove that many members have been busy during the winter, they have sent in various pictures of their developments in the line of model planes. Mr. William C. Drake of 3 Pine Street, Malden, Mass., has been improving his art, as evidenced by the drawing that he presents and which is at the head of our column. It shows the Fokker G.1 twin propeller ship, exhibited at the recent Paris Aero Show. This ship is of unusual design and presents many advantages from an attack and defensive standpoint.

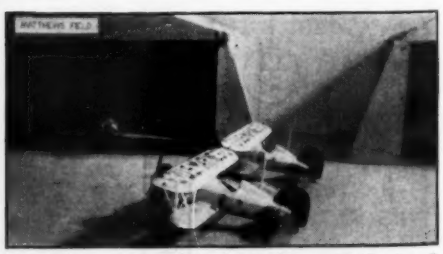
One of our club members, Blake Arnold Jr. of 404 Victoria Avenue, Chatham, Ontario, Canada, sends us picture No. 1, which shows his Boeing F4B-4 flying scale job. He tells us that it has a number of heavy coats of dope to which he attributes the sluggish action of the ship in flight.

Looking at the picture of the model we might suggest to Mr. Arnold that perhaps this sluggish action was due to an improperly designed propeller. It has fairly small blades and a fairly high pitch. This would cause it to spin violently without taking the plane any place. Such a plane should have a prop of double the area and about 2/3 the pitch shown.

Mr. Arnold says the model is made to an exact scale of half inch to the foot and is complete in detail, including built-up dummy motor, radio mast, aerial, deck landing arrester gear, dashboard, movable controls, machine-guns and pilot.

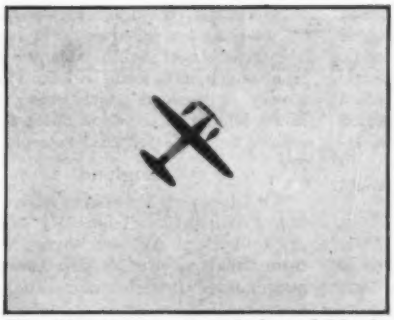
Many builders like to go to extremes in respect to realism. Mr. George Owen of 421 Fairview Avenue, Webster Grove, Missouri, appears to be one of these young men, for in picture No. 2, which shows his scale Vought, he has also added the touch of a dummy pilot spinning the propellers. From his position we would say that he is in extreme danger of having his leg chopped off if the propeller, by any chance, should start spinning.

Picture No. 3 shows Charles Twichell of



Pict. No. 5. A model of Matthews Field, Canal Zone, with two model Boeings ready for business

Pict. No. 7. This Boeing model won 1st place for Norman Gray at a New Zealand contest



Pict. No. 12. An unusual shot of Martin Rohnes' "hydro" in full flight at a contest on Staten Island, N.Y. Some flier.

Pict. No. 9. Juan Gotauco of Manila and one of his duration models

406 Prospect Street, New Haven, Conn., with three of his models. The one at his feet is a Taylor Cub powered with an Imp carbon dioxide motor. He tells us that it flies well. The other ships are smaller flying scale, rubber-powered jobs.

Picture No. 4 is an unusual and treasured shot of Mr. Edward A. Zahn's father in his glider, which was built and flown in 1910. Edward now lives at 29 Salisbury Avenue, Stewart Manor, New York. Mr. Zahn Senior was a member of the famous Harvard Glider Club and this glider was entered in a contest held by this club in Squantum, Massachusetts, in 1910. It was completed on February 22nd of that year, at which time the photo was taken. The glider was of the old single surface hang type. Zahn tells us that at the contest:

"Everything was ready for the flight. A tow-line was attached to a car which, ironically enough, was being driven by the famous aviation pioneer, Charles K. Hamilton. Mr. Hamilton started the car in motion and everything was going fine until the tow-rope parted.

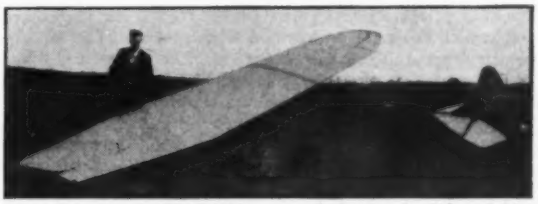
"By this time my dad was about fifty feet in the air, and as the ship had no controls it stalled and started for Mother Earth.

"The crash brought notables such as Lincoln Beach and Harry Atwood to their feet, but luckily no one was hurt even though the glider was nothing more than kindling wood."

So you see, Air Ways fans, young men in 1910 were just as intent on aviation development as you are today. The only difference was then they did not have such an easy time of it and had to create most of their own facilities and materials for carrying on their experiments. We have the greatest respect for these early adventuresome pioneers.

We now take you to the airport of Robert Blake of Balboa Heights, Canal Zone, Post Office Box 7, which is shown in picture No. 5. To be sure it is only a model airport; however, the small ships shown were made and are attended with as much care as their big brothers. They are two Boeing F4B-4s. A glimpse of a low-wing may be seen sticking its nose through the open door of the hangar. This airport is supposed to be Matthews Field, Canal Zone. The planes in the hangar were built by Mr. Blake's friend, Francis Criste, who has been making models for about three years.

Marvin DuChene of 22532 Gregory Avenue, West Dearborn, Michigan, is rather an ambitious person, as indicated by picture No. 6. Here he is shown with his Curtiss Wright Amphibian. This ship is of such a type that a large amount of careful workmanship must be displayed to complete it. Marvin writes us that it has a span of 4½ feet and is 3½ feet long. The hull and floats are covered with balsa, the whole plane weighing about eight ounces. The ship flew fairly well but unfortunately crashed on one of its flights.



Pict. No. 10. J. W. Dickinson and the local glider club's sailplane, built by club members. Later it was "washed out"

Pict. No. 11. J. D. Sigmond's fuselage model "pounding the air" over Java, N.E.I.

We wish to note here that the picture of the DeHavilland-4 which appeared in the February issue on page 18 was made by Stanley Orzeck. At the time this picture was published the name of the builder was not known, as Mr. W. L. Dusenberry, who was kind enough to send us the picture, neglected to give this information.

MODEL NEWS FROM OTHER COUNTRIES

New Zealand

We have a very interesting letter from Mr. Norman Gray of 21 Aldred Street C.1, Christchurch, New Zealand, who sends us picture No. 7. He tells us that the Boeing F4B-4 was made from plans appearing in Model Airplane News. He entered this ship in the Christchurch Winter Show and was awarded first prize. The plane took 203 hours to build, complete in every detail as given in the plans. The fuselage was covered with balsa and the plane weighs only 3½ ounces even though it has been painted. We wish to compliment Mr. Gray on his work. It is an exceptionally fine plane.

Perhaps some of our readers in the United States will write to him, as he is most anxious to hear from American model builders and to make contact with some who will supply him with pictures of American planes.

Belgium

We hear again from our old friend, Alfred Van Wymersch of 14 rue Berkendael, Forest, Brussels, Belgium. Mr. Van Wymersch is one of our oldest contributors to the Air Ways column, pictures of his work having appeared in issues of Model Airplane News published five years ago. This time he sends us picture No. 8, which shows a very neat low-wing job. One might think this was a gas job, but don't let it fool you. It is large enough for a gas job truly, for it has a wing span of

Pict. No. 8. Believe it or not, this is a 10 ft. low-wing exhibition model, built by Alfred Van Wymersch of Brussels

Pict. No. 6. Marvin DuChene and the Curtiss Wright Amphibian that he built. A real piece of work

three metres, which is equivalent to about nine feet, ten inches. The ship was made for a Christmas display which was set up in one of the town's shops. An electric motor drives the propeller, which has a diameter of two feet. Mr. Van Wymersch does not state whether or not he has attempted to fly this ship driven by a rubber motor. Such an undertaking might prove to be interesting.

Philippine Islands

The model plane club which started in Manila some time ago is going along very well indeed. We hear from Juan Gotauco of 656 M.H. del Pilar, Manila, P. I., who is president of both the U.P. Hi Aero Club and the Manila Model Airplane Club. He is shown in picture No. 9 holding his duration fuselage job. Though these boys are remote from the scene of activities in models, they are by no means novices. The model is of Gotauco's own design and it broke the Philippine record of one minute, thirty seconds, by flying two minutes, fifteen seconds. It has made many flights longer than this, however. It is powered with twelve strands of ⅛" black rubber. Since this record flight brown rubber was installed and a flight of two minutes, thirty seconds was made. The performance has been increased considerably.

Gotauco also writes us that he has made a microfilm job which has done over five minutes. It is an R.O.G. baby stick model and appears to be the first of its kind in the Islands. He gives credit to MODEL AIRPLANE NEWS for having supplied tables and principles which enabled the Philippine boys to become proficient in model work. The magazine is indeed glad it has been of service in this respect.

England

Now we jump to the British Isles. Mr. J. W. Dickinson of Lew. Lea., Kirkby-in-Furness, Lancashire, England, sends us picture No. 10, which shows him beside the local glider club's sailplane, which has been constructed by its members. Since this picture was taken, the glider has been relegated to the scrap heap because of a bad landing. Mr. Dickinson says:

"Conditions here are hardly perfect for model flying, but still we get along very well; and if one cannot fly a model there is always one to build. This is, to my idea, the most interesting part of this most fascinating of all hobbies."

Netherland East Indies

Now we take another big jump, away over to Java. From this far-off country we hear from Mr. J. D. A. Sigmond, Petjenongan 82 (pav), Batavia Centrum, Java. In order to prove that model fliers are proficient in their art in Java he sends us picture No. 11, which shows one of his fuselage models in level flight. Mr. Sigmond says that this is his latest model. It weighs ready to fly with eight strands of 1/24" square rubber, a little less than one ounce. The wing span of the ship is twenty-four inches and it has a fuselage length of sixteen inches.

On a test flight the ship stayed in the air for three minutes, ten seconds. Mr. Sigmond says luckily it was early in the morning and there were no up currents or he would have lost it. He claims the model is practically crash-proof, having landed on its prop several times. The secret of its strength and lightness is the material from which it is made, called Airplanood, a very light wood which grows in Java. More definite information about this wood will be available for readers soon.

England

We have a rather unique letter from an ardent British model fan; Mr. K. Gamlen of 61 Fareham Avenue, Rugby, Warwichshire, England. In his first paragraph he compliments us for a fine model airplane magazine. However, in the second he says that he feels we have been very inaccurate in telling about the fine qualities of British ships. This is quite natural and we compliment Mr. Gamlen for "standing up" for planes produced in his country.

The essence of his letter is that he feels the new British boats are far superior to the Sikorskys, Martins and other large transports of the United States. He also claims that the British fighters are far superior to the American machines in speed. He claims that most of the new ships have speeds well over 300 miles an hour. One of these is the Fairey "Battle".

After reading his letter one gets the impression that the age old battle of how fast an airplane is and which is better is still being carried on. However, all this makes for progress on all sides. Before making comparisons, however, it is well to know definitely the facts concerning various machines. Here in America it is difficult to tell what individual planes will do and it is logical to suppose that English fans cannot obtain a clear picture of the qualities of American planes. Perhaps some of our readers will write to Mr. Gamlen and inform him what American planes will do.

The essential difference between these two types of planes is that American planes are stronger and go over greater distances. In other words they are built for greater cruising radius. This requires greater weight of gasoline and a heavier frame structure. The range of operation is very large and a certain amount of speed is sacrificed for this quality. In fact, British machines and American machines are built for two entirely different purposes and cannot be compared accurately.

The ships that have been built for speed in this country are as fast as 350 miles per hour. You will recall that the four-motored Boeing bomber recently produced for the army covered a distance of about 2500 miles at an average speed of over 250 m.p.h. If this is its cruising speed over such a distance, we wonder what its high speed will be with a lighter load of gasoline.

Australia

Mr. H. Cooper of Rae Street, Roma, Queensland, Australia, is a scale model fan. He has built twelve scale models recently and is now engaged in fashioning a China Clipper. He is particularly anxious to have plans of new ships and wishes to know if any member of the Air Ways Club would care to exchange plans with him. If so, he will be pleased to hear from him. He says he has quite a number of plans of Australian designed flying models which have not been seen in America.

We take great pleasure in printing a résume of model flying activities for 1936 of the Model Flying Club of Australia, as compiled by Mr. Ivor Freshman of 67 Liverpool Avenue, Sydney, who is general secretary of the club.

"The National Flying Meet for model aeroplanes which was held last Sunday at Maroubra represented the culmination of some 9,000 officially timed flights throughout the Commonwealth during the preceding twelve months.

"Some eighteen months ago the first petrol-driven model plane was successfully built and flown at Kingsford Smith Aerodrome by Mr. J. Finneran, and since then the popularity of the power-driven model has gained to such a degree that Lord Wakefield of Hythe has made available to the Model Flying Club a magnificent trophy for competitions by these machines throughout Australasia.

"Today Australia holds the position of second in the world of model flying, being headed only by the United States. The progress which has led the Australian youth so rapidly into this position is due primarily to the nature of the activities carried out by the club. It is an inflexible rule that all branches of the club shall carry out three official contests each month, wet or fine, and it is so arranged that these three contests cover the entire field for rubber-driven model aeroplanes. There is the Angus & Coote Cup contest which is open to all types and all sizes of machines, and models participating in this competition are allowed to be launched by hand. Each month the winner receives a miniature cup, and at the end of the year the twelve finalists compete to determine the winner of the actual cup, which he retains permanently. Another cup is then made available for the coming year.

"The Anthony Hordern trophy—a splendid piece of workmanship in black marble, gold and silver, and valued at over £100, is the reward for those who fly another type of machine. In this case the models must be not less than 24" across the wings, and must rise from the ground under their own power. Each month the Air Centre medal is presented to the winner, and the finalists at the end of twelve months compete to determine who shall hold this magnificent trophy for the ensuing year.

"The Wakefield trophy for rubber-driven machines was made available to Australia to obviate the necessity for sending these large yet delicate machines to England for the annual Wakefield contest. Thus Australia is enabled to compete without the handicap of packing models in crates to ship overseas, with the consequent danger of damage in transit. The Australian Brodcasting Commission's medal is awarded to the winner of this contest each month, and the actual trophy is held by the winning finalist at the end of the year. This is retained by his club headquarters for one year or until such time as the trophy is won from him.

"Queensland was successful in winning the Wakefield trophy the first year it was made available and New South Wales won it for 1936.

(Continued on page 38)

A World Record Indoor Glider

Here's How You Can Build a Simple Glider That Has Remained Aloft for Fifty-Two Seconds on a Single Flight

TEX RICKARD

THIS glider is a very stable and consistent little plane, whether it is flown indoors or out. It glides slightly faster than usual, but as a result the thicker wing section gives more lift and you have a flatter glide. With this arrangement, more altitude may be attained on the launch. Experiments are now being made on an advanced type of glider which I believe will be capable of 60 second flights. I am sure that someone will be breaking the minute mark in 1936 because of the interest that is awakening in the minds of the model builders.

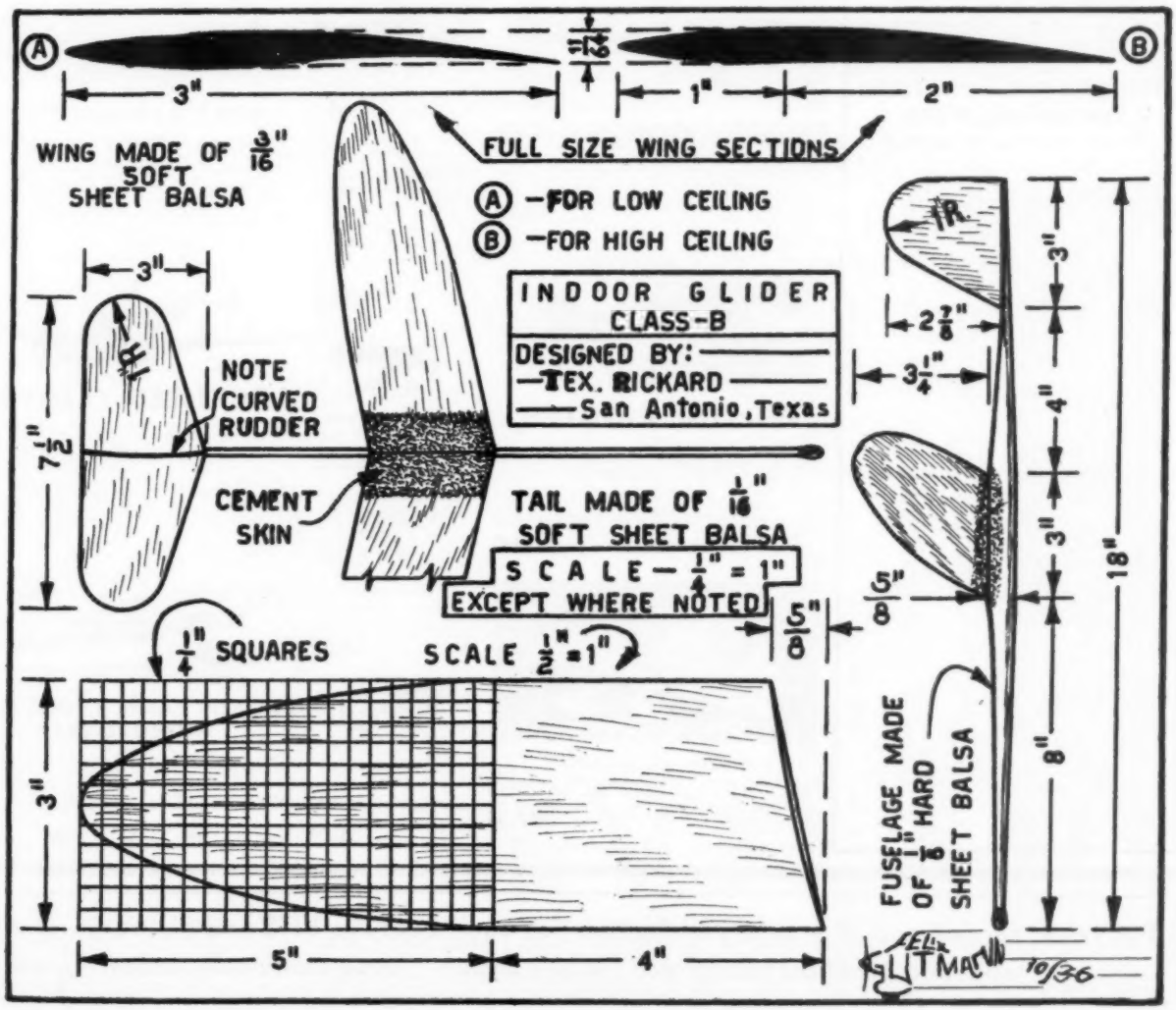
The solid balsa glider of today has advanced from a fast and erratic stunt glider to a slow, smooth flying and consistent model that can be depended upon to repeat record performances. Although experience is a great help, a beginner may build a solid balsa glider according to the directions of a record plane and with some practice in launching, make noteworthy flights. There are really not any hard things to do in connection with good glider building. All that is required is a steady hand, lots of patience and a lot of common sense.

These directions are written for the model builder who is just beginning or has not made many models, although the expert builder may find something helpful in them. The beginner should follow the directions exactly. Experienced builders have tried many ways of doing the things that are necessary to good model building and have learned from experience which are best. The beginner will do well if he follows the advice and directions of builders that know from experience instead of working as his mind dictates. After he has become adept and proficient in the construction of models, he should branch off and do a lot of work that is not already "on the books." Experimenting and the developing of new ideas is the thing that carries on model science and makes it interesting.

Wings

The wings are very important and should require about two and one-half hours of work to complete. Two sheets of wood 3/16 x 3 x 9½" are required. The shape of the wing may be drawn on one of them or on a sheet of cardboard if desired. Put the two halves of the wing together and cut both of them at the same time so as to be sure that they will be exactly alike. Shape the aerofoil roughly with a knife and the

(Continued on page 26)



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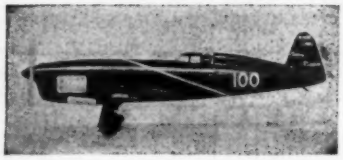

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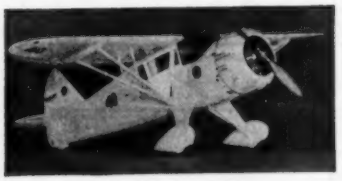

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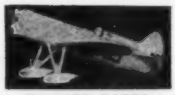

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Extremely well detailed. Span 23⅝". Sug. col.: gray, silver, yellow and red. Dry Kit SF-49, only **$2.95**

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Very pretty appearance. Span 15⅞". Sug. col.: gold and black. Dry Kit SF-46, only **$1.95**

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Twin motors! Twin rudders! This authentic C-D ½" scale model of one of the Great White Fleet has made a real hit among builders. Gorgeously streamlined—it creates a real sensation when it takes to the air. Has rubber motors protruding through the wings behind the nacelles. Thrilling to build—exciting to fly. Colored all silver. Span 27⅝". Dry Kit D-65 complete, except liquids, postfree, only **$2.75**

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2" ..... 1.50 4½" dia..... 3.75
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...ne	.025	.05	1/16	.04	.08
1/...	.03	.06	3/16	.05	.10
1/...	.03	.06	¼	.06	.11

STRIP BALSA

		Cross Section	
Quan...	4 for	.01	⅛x5/16	.01
	3 for	.01	⅛x¾	.015
1/...	2 for	.01	3/16 sq.	.01
3/...	2 for	.01	3/16x¼	.015
1/...		.01	¼ sq.	.015
1/...		.01	¼x5/16	.02
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...Model Tissue, 24x36"..... .10
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...4½" dia., each..... .03
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No. 24 is .023 dia., No. 20 is .034 dia.

	1 oz.	¼ lb.	Size	1 oz.	¼ lb.
...24	.15	.45	⅝xNo. 20	.08	.20
	.15	.40	¾xNo. 20	.08	.20
	.15	.40	7/8xNo. 20	.08	.20
	.12	.36	1xNo. 20	.08	.18

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HARD WOOD WHEELS

Th... side	Per Pair	Turned one side	Per Pair
	.08	1¼x¼	.04
...16	.04	1¼x⅜	.05
	.04	1¼x½	.06
...16	.04	1½x¼	.05
	.04	1½x5/16	.06
	.08	1½x½	.07
	.05	1¾x¼	.06
	.05	1¾x⅜	.07

BALSA WOOD WHEELS

	Turned Both Sides	Pr.	
		1¼x¼	.05
		1¼x5/16	.07
...16		1¾x5/16	.12
		2¼x½	.18
...16		2¼x⅝	.35
		2¾x15/16	.45
		3½x1-5/16	.65

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...Long, pkg..... .05

SMALL BRASS WASHERS

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MUSIC WIRE

...ia.	Ft.	No.	Dia.	Ft.
		10	.024	.01
...016 (1.64)	.01	13	.031 (1/32)	.01
...020	.01	16	.037	.02

CLEAR CELLULOID

	5x5	10x10	Thick-ness	5x5	10x10
	.04	.12	.030 (3/32)	.17	.60
	.06	.16	.045 (3/64)	.20	.75
	.10	.30			

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...SPATULA..... .08

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77 of these unusually bulky, but unbelievably beautiful planes have just been ordered by the U. S. Army because of its high speed and super performance. Span 24", beautifully colored, blue fuselage, yellow wings and tail. Very nicely trimmed with red stripe and white outline. Landing gear may be extended or retracted for display in any position. Super complete in every way, but DRY. Kit SF-61, postfree, only..... **$2.65**

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Famous U.S. fighter. Span 23¾". Sug. col.: yellow, O. drab (or blue), blk. and white. Dry Kit SF-21, only..... **$2.50**

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Span 20". Very pretty. Sug. col.: orange and cream. Dry Kit SF-1, only..... **$1.95**

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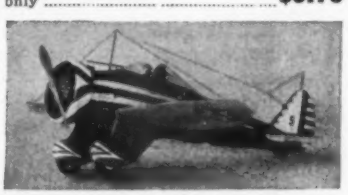
DOUGLAS TRANSPORT

Beautiful 42⅜" giant in dwarf (⅛") scale —a perfect miniature of the plane that has become the pride of the airlanes from coast to coast, and popular throughout foreign countries as well. If you've never built one of the larger models—this promises you a lot of real sport. Flies very gracefully. All-silver coloring recommended. Dry Kit D-55 complete (but no liquids), postfree, only..... **$3.75**



New C-D P26-A Fighter

Model is dazzling with its yellow wings, blue fuselage and gorgeous red and white scallops and stripes. Radio antennae adds unusual smartness. High speed flyer. Span 21". (Dry Kit SF-60, complete except no liquids, only..... **$2.65**
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WACO C-6 CABIN

Here is another real beauty for which the instructions and layout are given for coloring the model two ways, either all vermilion with black trim, or the wing panel stabilizer rudder light yellow, fuselage colored white, beautifully striped with red on both fuselage and wheel shoes and black lettering. A beautiful model for fine flights. Span 17½". Dry Kit D-62, complete except liquids. postfree..... **$1.10**

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CLEVELAND

MODEL & SUPPLY COMPANY, INC.

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A World Record Glider

(Continued from page 23)

final shaping is done with rough sandpaper, then smoothing the whole job down with ten nought sandpaper. The wing must be very smooth before applying the polish. The polish is used to close up the pores in the wood and hold down all of the wood hairs and fuzz and to give the wing a surface like glass. This reduces the skin friction to a minimum.

There are a number of liquids that are good as a wing polish. Some of them are—clear dope, banana oil, clear lacquer, and other nitro-cellulose solutions. When using banana oil as a polish, I advise the use of a few drops of castor oil to the ounce to make it flexible. I have found that banana oil used by itself, makes the wood brittle which is very undesirable. Three coats of polish are applied with sandings using ten nought sandpaper in between each coat. The wing when finished should have a smooth glass-like surface. After this is done, you are ready to glue in the dihedral. Lay one half of the wing flat and prop the other up so that the tip is six and one-half inches high. Be sure that the halves of the wing meet in a close fitting joint in the center. A cement skin is extended out one inch on all sides of the wing to make a strong joint. After the first coat of glue has dried, a second one may be put on the center joint so that it will look like there was a fillet of glue on it. This joint must be the strongest one on the plane.

Elevator

The elevator is built from a 1/16 x 3 x 7½" exactly as the wing was made except for the shape of the aerofoil. A symmetrical aerofoil is used on the elevator instead of a lifting one. Only two coats of polish are required on the elevators if careful sanding is done between each coat. After each coat of polish, the surface should be laid down flat and a glass bottle laid on it so it will not warp while drying. The change in the weather will make the wood warp very easily and this will be noticed especially on damp rainy days. Also the thicker wood will be able to stand the strain of the launch much easier.

Rudder

The rudder is made from a ⅛ x 3 x 3" sheet of balsa. It is cambered on the right side for a right-handed person and on the opposite for the left-handed one. Always remember that the camber should be on the outside of the circle when the model is flying. The cambered rudder allows the builder to use less "wash in" in the wing which reduces the drag to a minimum. It allows the model to be launched harder and the plane will go much higher because of the lower drag. Often it is hard to get the indoor glider to circle tightly without going into a spiral dive. By using a cambered rudder, this is eliminated to a great extent.

Fuselage

The fuselage wood must be chosen very carefully and accurately because it must be able to stand the strain of many launches and take the shocks of many landings. I used very hard straight-grained wood on all of my fuselages. The wood must not be brittle but very flexible. The places where the wing and elevator sit must be exactly in a parallel line to each other so the settings will be an exact zero angle. Two coats of glider polish will be enough on the fuselage.

Assembling the Model

My method of putting the glider together may not agree with the ideas of the other builders, but I have found it easier to align the parts of the model with my method. First I glue the rudder on top of the elevator. When this is dry, I glue the elevator on the fuselage and check it to be sure that the fuselage is perpendicular to the elevator and directly in line with the rudder. The flat side of the rudder is set at an exact zero angle to a line drawn down the exact center of the fuselage. Be sure the elevator is dry before placing the wing on its mount. A small V notch is cut in the top of the fuselage to fit the dihedral of the wing. Be sure that the wing is set at zero or a fraction of a degree of positive incidence rather than a degree of negative incidence. The slightest degree of negative incidence will ruin a model while the trailing edge of the elevator may be warped down to correct a degree of positive incidence. The wing is glued in place and I usually stick a pin down through the very center of the wing into the fuselage to hold the wing on while the glue is drying. If the pin is short enough so that it will not come out at the bottom of the fuselage, it may be left in. It will keep the fuselage from splitting at the wing mount.

As a final finisher, I used a cedar wax floor polish. This is rubbed on with a soft cloth and rubbed into all the pores of the wood that have not been closed by the coatings of the other polish. This polish must be put on after the model has been finished because the model cannot be glued with the wax on the wood. If the proper grade of material is used, the model should weigh about 48 hundredths of an ounce. My model weighed exactly .485 with about .015 of clay.

Flying the Model

It is often found that it is easy to build a model but impossible to adjust it so as to make it fly to record flights. Last October while preparing for the Junior Birdman local eliminations in San Antonio, I built a glider that would stay in the air about 27 seconds on all flights. With a little warping of the elevator, the model began to make 42 second flights. If your model does not fly well at first, do not be discouraged as it may be the final adjustment that is wrong.

The right wing is given a slight degree of washin for a right-handed person and opposite that for a left-handed. The model is launched upward at about a 70 degree angle and in a slight right bank. If the model rolls out at an altitude of less than 60 feet, the elevator should be "washed out" a very slight bit; by that I mean, the trailing edge warped down about 1/32". This gives the elevator a positive angle which will tend to make the model go over the hump and into a dive. If too much "wash out" is used, this will happen. The right amount must be determined by the model, experiment and trial. When the right amount has been determined, a boy with a good strong arm should get an altitude of 85' to 95' and flights of around 50 seconds.

How to Build a Speed Model Racer

(Continued from page 7)

ing for the rear fuselage hatch. 14 and 15. Light balsa bulkheads which hold the hatch to correct form and which hold it rigidly in the fuselage. 16. Longitudinal brace strips glued to the side of each body half to help withstand the torsion of the rubber. They should be made of hard balsa. 17. Slot in panel D to take the end of the forward landing gear wire strut. 18. Slot in panel E to take the bent up end of the rear wire landing gear strut. 19. Rear motor anchor hook which passes around the hard wood block No. 7. This whole unit is glued into bulkhead L. 20. A cross brace of balsa which is glued to the rear face of bulkhead H. Figure No. 2, shown in the drawing of bulkhead H, indicates the size of the reenforcing strip glued to the upper part of bulkhead H.

All bulkheads are shown full size. The wing and stabilizer should be filleted with balsa. The stabilizer and fin fillets may be made integral with the fuselage. A proper opening in this fillet will allow the stabilizer to be inserted. The tail skid may be made of light balsa covered with a strip of silk or linen at the point at which it contacts the ground. Propeller bearings should be of the ball bearing type in order to withstand the enormous torque of the motor. The motor should contain from 24 to 30 strands of ⅛" rubber. The wing is made of medium soft solid balsa cut to the section shown on the drawing. A small hard wood leading edge may be used. Light or medium light balsa should be used for the front and rear edges of the stabilizer. The wing should be set at zero degrees and the stabilizer at minus one degree. Small stiff paper tabs may be fitted to the rear edge of the stabilizer and to the fin in order to create a means of adjusting the flight of the model. The rear motor hook and the motor shackles are made of 1/16" steel wire.

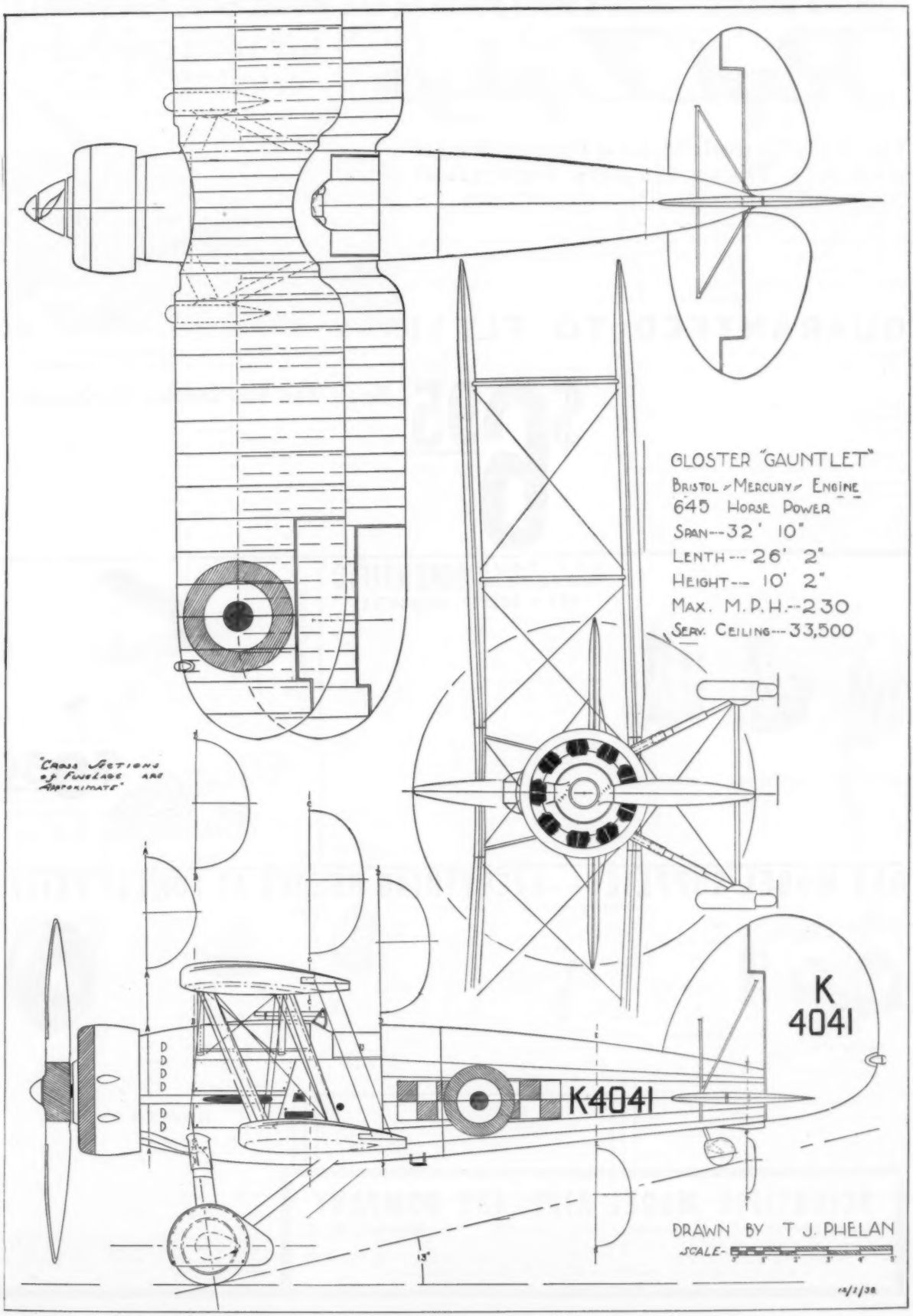
It is advised that in flying this model you should select some flying field on which there is long grass or which provides some other soft landing. Also, on its first few test flights do not wind the model to full capacity. Use only a few turns in order to make sure that the model is properly adjusted. After that, a real speed model test may be undertaken.

A Wiring System for Starting Batteries

(Continued from page 11)

The various parts of the circuit are located in about the same relative positions that they would be placed in the plane, for your convenience in tracing the circuit.

Since the model engine ignition circuit is a low-voltage current supply, it is essential that all connections be well made and, preferably, soldered. This includes the connections to the dry-cells, in order that no resistance is added to the circuit which will interfere with proper operation. All wiring should be installed in a neat manner and in such a way that separate wires are held apart from each other, to lessen the possibility of short-circuits and leakage from the high-tension wire to any of the low-tension wiring with a resulting loss in the effectiveness of the spark-plug's operation.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Precision Built! Accurate, fully detailed, full-size Drawings of all parts with complete instructions that simplify every step in the building, and give many labor-saving suggestions.

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GUARANTEED TO FLY!!

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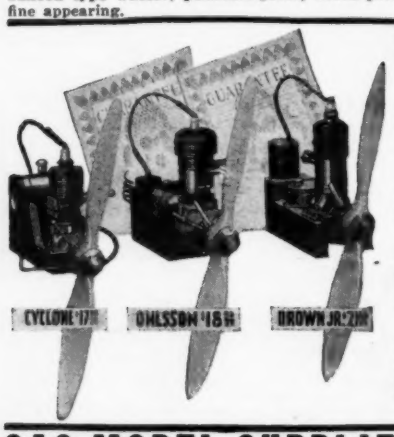

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1/32x1/2	.07
3/16x3/16	.05
3/16x1/2	.08
1/4x1/4	.06
1/4x3/8	.08
3/8x3/8	.10
1/2x1/2	.12
1/2x3/4	.15
1/2x1	.18
3/4x3/4	.15
3/4x1	.20
1x1	.25

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5 ft. Lengths	
1/32x2	$.10
1/32x3	.15
1/16x2	.12
1/16x3	.18
1/8x2	.15
1/8x3	.20
3/16x2	.18
3/16x3	.25
1/4x2	.20
1/4x3	.25
1/2x2	.25
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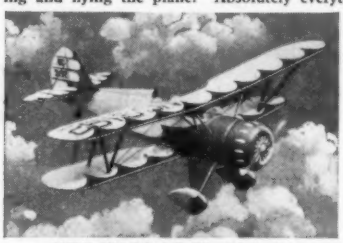
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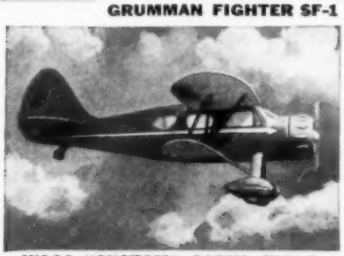
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What About Rockets?

(Continued from page 5)

eliminated.

The head, or nose of the rocket was utilized as the liquid oxygen tank. From this, a line fitted with a valve led to the combustion chamber. As liquid oxygen evaporates very rapidly at ordinary temperature, when the valve was opened, the pressure of the evaporated oxygen was used to force the liquid into the combustion chamber. To force the gasoline into the chamber a small carbon dioxide charger was placed below the gas tank. When the carbon dioxide was permitted to enter the gas tank, it created a pressure which forced the gasoline into the combustion chamber. (See Fig. 1). With the feeding problem solved it remained to select the metals to be used in the construction of the first Mirak (minimum rocket). What metal would withstand the extreme low temperature of liquid oxygen without getting brittle? What metal would withstand the excessive heat of the combustion chamber and what shape would be most efficient for the chamber? It was decided that duralumin would be used for the construction of the entire rocket with the exception of the combustion chamber which would be of a heavy copper alloy and shaped like a cone. Thus the first Mirak was completed.

Allow us to state at this point that the Miraks were not designed for altitude records. They were designed to be used on a testing stand so that the engineers could note the advantages or disadvantages of certain fuel mixtures and structural changes. On the testing stand the scientists recorded the power of the rocket motor and also observed its reactions during the experiment.

After many tests Mirak number one exploded. Skillful engineers conducted an investigation and it was discovered that the rapid evaporation of the liquid oxygen had caused the explosion. The excessive evaporation, they stated, was due to the close proximity of the combustion chamber to the oxygen tank.

To avoid the same occurrence with the second Mirak, the shape of the combustion chamber was changed and a new ceramic lining added. Should the new chamber overheat and excessive evaporation of the liquid oxygen continue, a safety valve was fitted into the nose of the rocket. (See Fig. 2.) When the second Mirak was tested it was found to be more powerful than its predecessor. It, too, however, exploded after a number of tests and a second investigation followed. The investigation revealed that the combustion chamber had exploded and that a new type of chamber would be necessary. Before a new chamber could be designed and a third rocket constructed, the necessity for a special testing ground became apparent.

The ideal site was discovered at Reinickendorf on the outskirts of Berlin. Here on September 27th, 1930, the German Rocket Society established the famous Raketenflugplatz or rocket flying field. From this field the third rocket was to be tested.

Because of the excessive heat in the combustion chamber, a properly designed cooling jacket was highly essential. After engineers had carefully considered the matter, they designed a new double walled chamber no larger than an egg. Around the chamber water was allowed to circulate. As an additional cooling measure, fins were also placed on the outer wall. Thus they completed the new motor or combustion chamber as we have called it. In addition to the new chamber the third rocket was to boast a new tank. This time instead of using the carbon dioxide charger to force the gas into the motor, nitrogen was compressed into a third tank and utilized to create the desired pressure upon the gasoline. (See Fig. 3.)

When the third Mirak was tested it proved a success. The tiny motor that the society had developed could lift the rocket skyward without fear of explosion.

After Klaus Riedel had developed a system by which a sky-going rocket could descend without damage, the society was ready to release its first repulsor (altitude rocket). Although the first repulsor reached the altitude of 150 feet it was only a question of time before the designs could be perfected and higher altitudes attained.

Today the rocket has been perfected to the stage where a tiny motor weighing about ¼ lb. could lift a twenty-five pound rocket and propel a ten pound rocket twenty miles in 1¼ minutes.

Needless to say that even greater results will be attained within the next few years.

Although the rocket design offers many problems to the scientist, the problem of fuel is the greatest yet offered. Physicists state that before a rocket can reach other planets, it must attain a speed of seven miles per second. Only when this speed of liberation has been attained will the rocket free itself from the force of gravity. To attain this speed and to propel a rocket beyond the earth's gravitational region, some 21,000,000 foot-pounds of energy will be required for every pound being lifted. No known fuel could supply this energy. The energy which is deliv-

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M & M Super Heavy Duty Wheel

SIZES 1¼—1⅜—1½—1⅝"—PRICE $0.50 Per Pair, Postpaid.
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ered from the liquid oxygen-gasoline mixture is less than 5,500,000 foot-pounds. Hence it is obvious that a new and more powerful fuel must be discovered before the astronauts' dream becomes a reality.

Although many scientists are hard at work developing new propellants, various engineers have proposed ships that could reach the moon with the present day fuel mixture. These rockets are so designed as to increase in bulk as their velocity increases. To accomplish this, various parts of the rocket are dropped to the earth as the fuel supply decreases. Thus the ship becomes lighter and can constantly acquire sufficient kinetic energy to overcome the earth's gravitational force. Actual figures show that such a ship might be possible. The cost of such a project, however, is so great that serious consideration for such a flight would be extremely silly and out of the question.

Although astronauts cannot reach other planets because they lack the proper fuels, they are not remaining idle. Already the rocket has been put to work as a mail carrier and obstacle jumper. Perhaps the most successful and best known rocket mail route is between Schöckel and Radegund, two small towns near Graz, Austria. Ing. Friedrich Schmiedl was the person who established this first officially recognized rocket mail service. His rockets deliver letters from one town to the other in a matter of minutes while previously it required hours by ordinary posts.

This work has inspired other rocket experimenters and plans are being developed for a trans-oceanic rocket postal service. Through a service of this type, mail could be sent from London to New York in less than thirty minutes. The mail would not be subjected to weather conditions, as the rockets would travel above the troposphere where no atmospheric changes occur. The mail rocket, engineers state, would be shot into the air from London. By the time the fuel had been consumed it would have reached its maximum height over the mid-Atlantic. The rocket would then start its journey earthward at a rapidly increasing rate of speed. Before it could reach its landing place, the speed would be checked. This would be accomplished by various mechanical devices such as flaps, etc. When the ship had lost sufficient speed a parachute would be opened and a safe landing would be made. To make this service dependable and desirable, engineers plan to be in constant communication with the rocket. Thus via radio they will know the exact location of the ship during the entire flight.

It is easy to understand that even though the rocket cannot as yet reach other planets as scientists intend, it will be of extreme importance to us on earth. Through it the nations of the world will be brought closer together and a better understanding among men will result in the peace and happiness we all crave.

In the next issue the development of the rocket within the United States will be discussed. A detailed account of the experiments of the American Rocket Society will be given as well as many photos illustrating these experiments.

Designing Your Model for Distance

(Continued from page 7)

most important requirements of a distance plane; i.e., that the motors should absorb a large number of turns. With any given propeller pitch the more turns that are in the motor the greater will be the distance that the plane will travel under power. The motors should be strong enough, however, to give the model a strong steady climb.

It is important for other reasons that the model should have a very low resistance to forward motion. The power of the motors is converted into *thrust* and *distance travel*. Actually the power delivered by the propeller when driving the plane through the air is equal to the *thrust* times the *distance* per minute that the plane moves forward. It can be seen then, that for any given amount of power delivered by the propeller, the distance travel per minute will be greater if the required thrust is small but can be continued over a long period of time. This means that a low thrust being sufficient, the propellers may be made with a high pitch and the power may be converted into distance travel in this way. The higher the pitch (up to a certain degree) the greater will be the distance the plane travels in one revolution of the propeller.

Speed

The factors which have the *most* important bearing on the proportions of a distance model are: 1—The requisite that the model fly in a straight line and 2—that it will create the least possible resistance to forward motion.

These factors must have precedence over the fourth factor of speed. Actually it is advantageous that a distance model fly slowly in order to translate the power into distance rather than into thrust required to overcome the resistance generated by high speed. Some will remember from information given in previous pages of this series, that the *power* required increases in proportion with the cube of the speed, (V^3). Thus high speed uses up power that might be converted into distance travel. However, the demands of a straight flight capacity and low resistance usually require the plane to be of such proportions that it is naturally faster than a normal duration model. For

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instance, in order to insure a straight flight the wing span should not be large, for large wing spans have a tendency to turn the model to one side or the other. But if the span is not large a slow flying speed is difficult to create.

If the camber of the wing is made large to insure a slow flight then the *resistance* of the plane is increased. This is of course undesirable. So it seems to be inevitable that a distance plane will be faster than a duration model. The whole trick is to create a plane that will fly straight at a speed which is as slow as possible.

Glide

The fifth factor, a good glide, is usually of great advantage to a distance model, especially if the model glides straight without turning from the straight flight path followed from the starting point. In this way, considerable "distance" can be added to the flight which the plane makes under power. Primarily a good glide requires a high lift to drag ratio for the model, so again it is evident that this type of plane must be designed to offer very little head resistance.

In order that a good glide may be of advantage it must be straight. This presents an interesting problem for the designer. Every trick should be used to provide the ship with straight gliding qualities.

Stability

Obviously, stability, our sixth factor, must be one of the outstanding characteristics of a distance model. If such a model is not stable, especially in a directional sense, it cannot fly straight. Therefore great attention must be paid to design factors which will insure stability.

Contrary to general opinion, a distance model presents one of the most difficult problems of design, for the plane must not only fly for a long time but it must "cover" ground in *one* direction. This latter requirement demands that the designer must know how to make his model "do his bidding." He must be a master of the technique of flight *control*. Any amateur model builder can make a plane that will fly for duration, possibly having the good fortune to find a thermal that will take it aloft, but it requires a real expert to design and build a distance model of outstanding qualities.

Type of Model

It is now the problem of the designer to decide what type of model will carry out, to the highest degree, the requirements of a distance model. Summarizing them, they are: 1. A straight flight. 2. Long propeller duration, which means a slow turning propeller coupled to a motor that will deliver many turns. 3. Low head resistance and high lift. 4. A speed which is not any faster than required by factors that give the plane straight flying and low resistance qualities.

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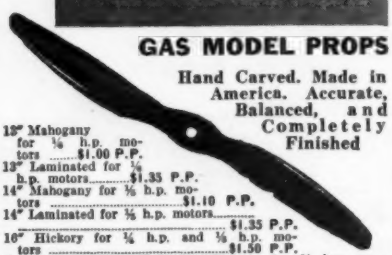

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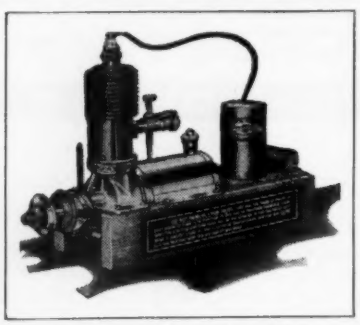

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Now let us consider the inherent performance qualities of various types of planes, and how well they will fulfill the demands of a distance model plane.

There are two general types to be considered: 1—The single propeller plane and, 2—The twin propeller model. The first question we must ask ourselves is: "Which of these two types is capable of making the straightest flight, consistently, over a long distance?" The answer is obvious to model designers who have flown both of these types of planes. The torque developed by the propeller of a single propeller model invariably turns the model to one side or the other. It is possible to design a model of this type that will fly straight, but it requires very careful designing and adjustment for flight. Even under these conditions a single propeller model is of such a character that once it is turned from its straight flight path directionally, there are no reactions set up which will cause it to seek its original course. As a rule such a model will continue on its new course when swerved aside, or it will continue to turn.

The twin propeller plane does not possess the tendency to turn due to torque reaction because the propellers turn in opposite directions, the torque effect of one balancing the torque effect of the other. Not only is there no *disturbing* element in this type of model, but when the twin propeller model is of the pusher type, it possesses the ability to *recover* and *seek its normal course* when it is thrown off the straight flight path by some influence *outside of itself*.

Such recovery is accomplished by giving the front plane of the twin pusher a large dihedral angle and using a normal straight rear wing without dihedral. The effect of this combination is to hold the nose of a plane up when it banks to one side, but to allow the rear of the model to slide in toward the direction of turn. This action realigns the model into its original direction of flight.

Therefore, in respect to straight flying characteristics, the twin pusher is superior to all others. Our second choice would be a twin tractor and third choice a single propeller tractor. A single propeller pusher is out of the question entirely for it is one of the most erratic types of plane it is possible to create.

Briefly, the twin pusher has the capacity to make the straightest flights because its type of design embraces fewer disturbing factors and greater directional recovery ability than any other type of model.

The next consideration when selecting a model type for a distance plane is head resistance. The machine which offers the *least* head resistance relative to the lift generated will make the best distance model provided it also possesses straight flying qualities. From the standpoint of resistance or high L/D ratio the single tractor fuselage model has a slight advantage. The twin pusher can be designed to offer very little resistance if the sticks and bracing are carefully streamlined. Such a plane should offer only slightly more resistance than a model of the tractor fuselage type. This added inefficiency of the twin pusher, however, is not enough to overcome its advantage as a *straight* flier, or its greater *power capacity* compared with the tractor.

This large power capacity is one of the virtues of the twin pusher. As you will recall, one of the requirements of a distance model, listed in the first part of this article, is that the propellers travel a long distance forward in one revolution and that the motors absorb a large number of turns. Twin propellers may be made with higher pitch than single propellers because the torque produced by twin high pitch propellers is balanced. Therefore very high pitch propellers may be used on twin pushers, which will produce a large forward distance travel for every revolution. Also more turns may be put into twin motors than into a single motor which generates the same propeller thrust as the twin type of power plant. Each motor of the twin variety may have a smaller cross section than the one motor of the single propeller type. Thus more turns may be stored in each motor of the twin.

Twin motors also may be made greater in length and thus have a still greater capacity for storing turns. This greater motor length may be used because a twin pusher may be designed with a larger percentage of its total weight in the weight of the motors, than it is possible to have in the single motor type.

In respect to the ability to pack power per unit weight of model into the two general types, single tractor or twin pusher, the twin is by far superior. This advantage far overbalances the small margin of superior aerodynamic efficiency the tractor may have.

In light of the qualities considered so

far, the twin pusher will prove to be the best distance model.

Next month the discussion of the design of distance models will be concluded.

A Timer For Gas Models

(Continued from page 41)

diagram to hold the unit to the base.

When the unit is fully wound, you will note that the arm that moves out from it has a right angle, bent on the end. Straighten this angle with a pair of pliers so that it becomes a straight bar. This completes the mechanical or positive side of the switch.

For the negative side of the switch, take a brass strip about 4" long, and bend it in the center. You then have a double piece of brass 2" long. Next take your pliers and bend a right angle, ½" from the double end. Then measure the thickness of the timer unit to determine the length of the next angle. The units are usually 3/16" thick. After finding the correct length, bend another right angle, then take your snips and round the corners of the long ends, and drill a ⅛" hole centered in the ½" end.

The timer bar must travel between the two blades when it is being wound.

Assembly

To complete the timer, mount the two parts on the base. On the left side of the base, place the positive timer unit so the bar will travel toward the right when winding. Drill two ⅛" holes in the exact location as on the unit; and fasten with the 6-32 screws.

The negative side should be so placed that when the unit is unwound or at zero, there should be 1/16" clearance between the unit arm and the double blades. Drill a ⅛" hole and fasten with a 6-32 screw.

By using a stop-watch and a file, you can place notches on the timer bar at 5- 10- 15- 20-, etc., seconds, for correct timer settings.

When attaching the unit to your model, fasten it tightly, so it will not vibrate. This may be done in the manner best suited to the construction of your model.

The writer attaches the timer to the right side of the fuselage, near the nose, with small wood screws, as you will see in the picture. The timing switch is placed in the circuit with the main switch leading from the battery to the ground. Note the wiring diagram.

The wires may be soldered directly to the timer unit on one side and the double brass blades on the other. Or it can be made interchangeable by the use of small battery clips. The writer's good friend, Alan Booton, of Asheville, North Carolina, uses this system.

Hints for Using the Timer

Familiarize yourself with the timer by giving it some tests in the shop before attempting flights.

When you understand it, place the model on the runway, set the timer for a pre-determined time; fifteen seconds is good for a start. Lock the timer but leave the main switch open. Prime the motor, close the main switch, run the engine as long as you wish, because the

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circuit is closed. Just before the take-off, lift the locking bar, and in fifteen seconds the circuit breaks; then the model will start for a landing.

Never forget to release the locking bar, just before the take-off.

The model will perform best if set to fly in large, left-turn circles of about 600 feet diameter.

If the model has too little time setting, it will not gain enough altitude to recover its glide, and the result will be a bad landing.

By the use of the timer, you will be able to get in more flights during an afternoon. You can study the action of the model at close range, and also have an afternoon of fun flying gas models. After a few flights you will be able to time the model, so it will make a few large circles, and return to its starting point. The writer has accomplished this feat many times.

Frontiers of Aviation

(Continued from page 9)

the pilot. The engine nacelles hang low under the wing and completely hide the landing gear when "tucked up." A contributory factor towards the sleek design of the Amiot is the wonderful finish. It is covered with metal skin with flush rivets. As yet the plane has not been flown, but we expect it will perform very well.

There were three other twin-engined planes of the same general layout but very different in appearance. One was the latest Potez which has already received much flight testing, another, the Marcel Bloch, covered by gun turrets in very effective places, and then there was the Breguet which is an improvement of the former well-known models whose fuselage was situated mainly between the two wing panels with the tail connected to a single boom extending in the rear. Conventionalism persisted among the French pursuits at the show. The new Loire-Nieuport and the Morane were the most outstanding and of the usual low-wing design with the pilot sitting in an enclosure over the fuselage. They as all the other ships present seemed very fast and would put a doubt in anybody's mind that we had the fastest airplanes in the world.

Last but not least was the Hanriot Fighter. Two 220 hp. Renault engines located well forward of the wing supplied the power. The belly of the short fuselage hung well below the wing and the top of the fuselage was completely glass enclosed above the wing. Three persons sit in tandem fashion in the fuselage.

We note that both the Potez and the Morane had dihedral angles in their stabilizers which was discarded in this country some years ago. There were many other airplanes of historic value at the exhibition and those that have already been described in these columns in former issues. The show this year showed us just precisely what the major part of Europe is doing and that we will have plenty of competition during the next few years, at least. However there were no huge flying boats present and most planes were military weapons.

France especially has spent a great deal of attention to the streamlining of her aircraft, and they had the best finish of any aircraft we have yet seen with the exception of a few planes of the Heinkel variety produced in Germany a few years ago.

While all of Europe is thinking in terms of fighting planes and more fighting planes, one of our own well known companies has also produced an air weapon that we wish had been in the Paris show. It is the new so-called North American "Dragon," a sleek twin-engined bomber that would make any enemy quiver with fear. It is the latest creation of Mr. J. H. Kendelberger, president of the company and co-originator of the Douglas DC-2. Truly a mid-wing, the airplane has all the characteristics of the perfect modern bomber. Its two engines are fourteen cylinder Twin-Rows which we believe are of the new 1260 hp. type of Pratt & Whitney. Their frontal area is very small and affords good streamlining of the engine nacelles which hang low under the wing to house the landing gear. In comparison with the giant dreadnaught of the air, their frontal area seems so small that we do not think in-line engines would have any better advantages in streamlining.

The nose is shaped like the point of a bullet and the pilot and co-pilot are housed behind a well-streamlined windshield. The "belly" of the huge fuselage which carries a crew of ten, raises slightly in the rear and here is placed a gun turret. We believe the cabin may be sealed for stratosphere flying and are of the opinion that five machine-guns are carried in all.

Pierre Cot of France has announced that the New York-Paris Air Races will be opened only to multi-motored airplanes and instead of being staged in one day the entrants have the entire summer to cross the Atlantic. At the end of the season, the fortunate ones holding the best time for the trans-Atlantic crossing will get the big money prize. It may be that the new twin-engined Beechcraft will be entered in the race. There is some talk that K.L.M. may fly one of their new DC-3s across after it is completed at the Douglas plant (a very likely winner). We understand France may try to push one of those Farmans across, but at this writing the only official entry is that of that daring Mr. Merrill who flew the Atlantic last year with Harry Richman. Clyde Pangborn has been aching for

DOPE *for your* **MODEL AIRPLANE**

Attention, Model Builders! You can now obtain a special "Air-Toughened" airplane dope in beautiful transparent colors. Make speedier, weather-proof and more beautiful planes than ever before.

PACKED IN LOTS OF 3 HALF PINT CANS ALL FOR **1.00**

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RED
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GREEN
CLEAR
PINK
ORANGE
BROWN
PURPLE

LIBERAL TRIAL SAMPLE 25c
ORDER YOUR 3 CANS TODAY!

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CHAMPIONS!

only a limited number of contest winning kits left. The CHIEFTAIN took 1st place in the 1936 KRESGE MEET, 23 min. on 1/16 oz. gas. The BUHL PUP TOOK 3rd place. REMEMBER: All our kits are guaranteed. Send 50c for packing and postage on each kit.

THE CHIEFTAIN

7 ft. 4¾ lbs.

One of the steadiest fliers, over 700 successful flights, complete in all respects; full-size wood, plans, wire, cement, dope, bamboo paper, blocks, wheels, etc., etc., etc.

STANDARD SET, ONLY.....$4.00
DE-LUXE SET, ONLY.....$7.00

ALL OUR DE-LUXE MODELS

contain in addition to the regular materials supplied in each kit; 1 finished carved propeller, 1 pair air-wheels, 1 set cut-out ribs; 2 ½-pint cans of any colored dope. Buy the De-Luxe models and save money.

THE BUHL PUP

7 ft. Wt. 5 lbs.

This kit contains full-size wood; plans, cement, paper, etc. Same as Chieftain.

STANDARD SET, ONLY.....$4.50
DE-LUXE SET, ONLY.....$7.50

SPECIAL PRICES
THE STARLET

6½ ft. Wt. 4 lbs.

The best ship of them all complete and guaranteed in all respects full size strips; plans, cement, dope, etc. Same as our Chieftain Set.

STANDARD SET, ONLY.....$3.00
DE-LUXE SET, ONLY.....$5.75

SOME PEOPLE LIKE TO GAMBLE!!

It is a known fact that some people like to gamble but others like to stick to the sure winners. We are directing this message to those who like the sure winners only. HEATHE is selling *quality guaranteed supplies*—at the *lowest prices*—and giving *same day shipping service* on all orders. We GUARANTEE every order that goes out of our factory. If it is not satisfactory, it can be returned at our expense! If you want to join the ranks of the Champions, if you want to be a "sure winner," if you want to deal with the supply house that unconditionally guarantees every order—BUY FROM THE HEATHE MODEL AIRPLANE CO.

FREE PREMIUM COUPONS with all orders from HEATHE. These coupons can be exchanged for AIR WHEELS, GAS MOTORS and many other valuable gifts. Coupons and catalog with every order.

Special Aircraft Lumber for Gas Models

All Five Foot Lengths

The following wood can be had in Spruce, Bass, or Balsa at the Same Prices as those listed below.

¼x¼	.03
⅛x¼	.03
¼x½	$ .07
3/16x3/16	.04
3/16x¾	.05
3/16x½	.07
3/16x1	.08
¼x⅛	.05
¼x½	.06
¼x1	.10
⅜x⅜	.09
⅛x½	.10
½x1	.18
1x1	.25

Sheet Balsa (Special for Gas Models)

36" Lengths

1/16x2	.04
1/16x3	.06
3/32x2	.05
3/32x3	.09
⅛x2	.05
⅛x3	.09
3/16x2	.07
3/16x3	.11
¼x2	.09
¼x3	.15
½x2	.18
½x3	.30

For Five Foot Lengths in Sheet Balsa, Double Three Foot Length price.

Reed

⅛, 3 ft. for .05
2/16, 3 ft for .07

Birch Dowels 36" lengths

3/16 dia..... .04
¼ dia..... .05

Spun Aluminum Wheels

5" dia. per pair only $1.50

Gas Model Wheels

Special pneumatic wheels good for gas model from 3' to 8'. Size 3½". Price pair $1.50

Carved Props for any Motor, each only $1.00

Shaped Propeller Blanks

Accurately cut of selected wood to exact outline of Brown, Cyclone, Gwin, Black, Forster, or Loutrel templates. Specify size of prop & Motor, each only....25c

Toggle (On-Off) Switches, 45c

Miniature Knife Switches

2 poles.....25c each
3 poles.....35c each

Cement & Dopes

These liquids are specially made for gas powered models and should not be confused with those used for rubber powered models.

4 oz.	.18
1 pt.	.60
1 qt.	1.00

Gas Model dope and paper adhesive same price as cement.

Spring Steel Wire (In five, 5-foot lengths.)

1/16 dia. 5'....	.05
3/32 dia. 5'....	.15
⅛ dia. 5'.....	.25

Dural Angle Beam

⅛"x⅛" foot....	.20
¾"x¾" foot....	.30

Sheet Celluoid

12x16 sheet..... .18

Colored Dope

A high gloss color. Choice of Red, Blue, Black, White, Grey, Olive Green, Orange, Yellow, Cream, Silver, Gold.

4 oz.	.20
1 pt.	.65

Aluminum Tubing

1/16 dia. ft.....	.08
3/32 dia. ft.....	.09
⅛ dia. ft.....	.10
2/16 dia. ft.....	.11
¼ dia. ft.....	.12

Sheet Aluminum

1/32", 6"x6"...	.15
1/16", 6"x6"...	.28

Bamboo Paper

24"x36" sheet.. .05

Special Jap Silk

Grade A silk per yd. ..... .40

Model Makers Knife

each ..... .10

Model Making Pins

per 100..... .05
T Pins 50 for.. .10

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BROOKLYN NEW YORK

How to Order

Add 15c to orders under $1.50. Orders over $1.50 add 10% of order.

Add 20c to all orders that contain balsa or wire in 5-foot lengths to cover special handling. All orders shipped same day received.

GUARANTEED Rubber-Powered KITS

All HEATHE KITS are made of the highest quality materials. Each kit contains: complete materials to build model; carved props; copyrighted plans; simplified instructions; printed balsa; cement, dope; colored paper; extra stock of all parts.

POST-ROGERS LOCKHEED

A 3 ft. Scale Craft Flyer; a 3 minute flyer.

Price $1.50 Plus 25c postage

MONOCOUPE "145"

A 3 ft. Scale Craft Flyer; a model you would be proud to own.

Price $1.25 Plus 25c postage

GIANTS

48" CURTISS ROBIN
36" WINNIE MAE
36" SOPWITH CAMEL

$1.00 each Plus 25c postage

32" FLYERS

WACO YOC; STINSON RELIANT SR7; MACCHI-COSTOLDI MONOCOUPE 90A; MISTER MULLIGAN; CURTISS GOSHAWK; CURTISS OSPREY.

50c each Plus 15c postage

25" FLYERS

SPEARMAN; F A I R-CHILD; NIEUPORT 17; FOKKER D8; MONOCOUPE 90A; BEARWIN; STINSON SR7; DELLANCA; TAYLOR CUB; CURTISS ROBIN; BRISTOL FIGHTER; KINNER SPORTPLANE.

25c each Plus 10c postage

a flight across the Atlantic or some place far away since we do not know when, and it is a likely conclusion that he may enter, plus one good Burnelli transport. Of course there are a score of other people who are planning to "cop" that 1,500,000 franc first prize, but whether they will ever be on the starting line will be another story. France, if existing spirit keeps up, will be very much present, decked in an array of Blochs, Caudrons, Amiots, and anything else they may have on hand. The DeHavilland works are liable to have a couple of their new four-engined trans-Atlantic airliners in the race. The first of these should be completed as this is read, and it will be double the size of anything DeHavilland has built yet! They are being built mainly for trans-Atlantic airline service it is understood.

The passing of time makes our once "mystery ships" anything but a mystery. Details which were guarded with the greatest of care are within a short period of time available for the perusal of anyone, and we often wonder why they ever took the trouble to keep such minor details a secret.

Only a few of the airplanes built for the Army and Navy become widely known, and they are usually the ones that are accepted for use in the air services. Some of those not accepted however are exceptionally fine airplanes.

Has anyone ever heard of the Vought two-place XF3U-1 fighter for the Navy which was built in 1933? This plane was probably the forerunner of the SBU-1 now in use by our Navy as it very much resembles it. However for fighting purposes the enclosure for crew is differently designed and a smaller and more "speedier looking" rudder is employed. The latest modification of the SBU-1 is the XSB3U-1 which is almost the same airplane except that it is equipped with a retractable landing gear. The gear is of simple two-strut design and swings backward up into the fuselage.

We liked the Navy Great Lakes dive bomber XB2G-1. It is a tapered wing biplane with good proportions and much resembles the two-place Grummans. The landing gear retracts into a fat "belly" as of the Grummans. A well cowled 700 hp. Twin Wasp Jr. is the power-plant.

The Douglas Patrol Bomber (XP3D-1) as first built for the Navy had its two Twin Wasp engines mounted high above the single wing as on the Douglas Dolphins. For a recent competition the flying boat was redesigned and is now known as the XP3D-2. Its wing was raised somewhat and the two engines were installed in nacelles in the leading edge of the wing. Retractable wing floats were incorporated and an elliptical gun turret built in the nose. The wing appears to be identical with that used on the new DF boats, but the hull is very much different.

The Royal Air Force Quarterly a few months ago said that a new Twin Row Wright engine with twelve cylinders and which exceeds 1200 hp. is being tested as well as a new Allison 12 cylinder in-line engine. We hear a leading California aircraft builder is constructing a plane around a new in-line Lycoming engine.

How to Build a Scale Model of the Douglas DF Airboat

The entire model is to be made of balsa wood which may be purchased in any popular department store or model shop. Also purchase a small tube of colorless model cement, fine and coarse sandpaper, small cans of yellow, green and silver dope, and a couple of small paint brushes. The tools needed are a razor blade, small sharp chisel, and saw.

Get dimensions for purchasing wood from the accompanying plans. To make measuring easier, connect the corresponding dots on border with straight light pencil lines. Each square will equal four square feet.

Make the hull first as that is the most difficult part of the model to make. Draw the top view of the hull on stock with the grain running lengthwise. Cut around the outline with your saw and shave down the sides with the chisel. Then draw the side view outline in the correct position on the hull and chisel to shape. When using the chisel always start near the center and work towards the ends with the grain so as not to split the wood. Round off the top and sides of the hull as shown by the cross-sections and the front view. Make good sharp edges on the bottom of the hull. Go over the surfaces with coarse sandpaper until all the rough spots are eliminated. Then follow up with fine sandpaper, making a smooth surface for painting which follows later.

The same procedure is adapted in making the other parts of the model. Draw the outline of the pieces and then cut. Then

SUPPLY HEADQUARTERS

GAS POWERED

FREE with every order of $4.00 or over we will give 1 pint of cement and free postage in the U.S.A.

Aircraft Spruce
5 Ft. lengths

1/8 x 3/16	1 for .04	3/16 x 2	2 for .30
1/8 x 1/4	1 for .05	1/4 x 2	2 for .35
3/16 x 3/16	1 for .07	1/2 x 2	1 for .30
3/16 x 1/2	1 for .10	Double the 2" price for 3" widths.	
3/16 x 1	1 for .15		
3/16 x 3	1 for .40		
1/4 x 1/4	1 for .09		
1/4 x 1/2	1 for .14		
1/4 x 1	1 for .27		
1/4 x 3	1 for .45		

Balsa
5 Ft. lengths

1/8 x 1/4	4 for .10
1/8 x 1/2	3 for .14
1/8 x 1	2 for .17
3/16 x 3/16	8 for .25
3/16 x 1/2	2 for .10
3/16 x 1	2 for .19
1/4 x 1/4	6 for .25
1/4 x 1/2	4 for .25
1/4 x 1	3 for .25
3/8 x 3/8	3 for .25
1/2 x 1	1 for .18
1 x 1	1 for .25

Gas Model Balsa
36" or 18" length of gas model balsa can be had. See our regular list of model supplies above. Please mention its use.

Sheet Balsa
5 Ft. lengths

1/32 x 2	3 for .18
1/16 x 2	2 for .22
3/32 x 2	2 for .25
1/8 x 2	2 for .27

Hard Aluminum Angle
1/16" thick for motor mounts.

1/2 x 1/2	Per ft. .16
3/4 x 3/4	Per ft. .20

Aluminum Rivets

1/4 Dia. head	doz. .05

M & M Air Wheels

3 1/4" Dia.	Per pr. $1.50
4 1/2" Dia.	Per pr. $3.75

Hard Aluminum Sheet

1/32 x 3 x 12	.15
1/16 x 3 x 12	.28

Gas Model Cement, Clear Dope, Thinner and Colored Dope. (Including all colors.)

3 oz. can	.20
1 pt. can (16 oz.)	.60

Gas Model Props
For all makes of engines.

12"	.75
14"	.75
16"	$1.00

ORDERING INSTRUCTIONS
Add 15c packing charge on orders for less than $1.50 in U. S. A.
All orders over $1.50 sent postpaid. Minimum order for 5 foot lengths is $1.00.
Canadian charges 25c extra. 5 foot lengths sent express charges collect to Canada.

RUBBER POWERED

FREE with every order of $1.00 or more, (kits excluded), we will send 100 1/16 sq. x 18" balsa strips, 10' of rubber, 1 sheet of balsa and one 1/2 oz. bottle of cement.

Balsa Wood
18" Strips

1/16x1/16	30 for .05	1/16x1/8	16 for .05
1/16x3/16	15 for .05	1/16x1/4	14 for .05
3/32 sq.	12 for .05	1/32x1/4	10 for .05
1/8 sq.	10 for .05	1/8x3/16	8 for .05
1/8x1/4	7 for .05	1/8x3/8	6 for .05
1/8x1/2	4 for .05	3/16x1/2	2 for .05
1/4x1/4	3 for .05	3/16x1/2	2 for .05
1/4x3/8	2 for .05	1/4x1/2	2 for .05
1/2x1/2	2 for .05	1x1	1 for .05

18" Sheet Balsa

1/32x2	6 for .10
1/16x2	6 for .13
3/32x2	5 for .10
1/8x2	4 for .12
3/16x2	3 for .13
1/4x2	3 for .14
1/2x2	2 for .11

Wood can be had in 36" lengths or 3" widths by doubling the 18" price. We also cut special sizes. Send in for prices.

Balsa Prop Blocks

1/2x3/4x5	5 for .05
3/4x3/4x6	4 for .05
5/8x1x7	3 for .07
3/4x1x8	2 for .06
3/4x1 1/8x10	2 for .09
3/4x1/4x12	1 for .06
1x1 1/2x12	1 for .08
1x1 1/2x18	1 for .09

18" Plank Balsa

1x2	1 for .15
1x3	1 for .20
2x2	1 for .25
2x6	1 for .45

Insignia
Sheet containing 4 sets of American, French, English and German. Sheet ..... .06

Dowels

1/16x12	1 dos. .05
1/8x36	2 for .05

Clear cement, colored dope and clear dope (including all colors.)

1 oz. bot.	.10
3 oz. can	.20

Japanese Tissue
20x24

White	2 for .05
Colored	3 for .12
(All colors)	

Brown Rubber

1/16 sq.	20 Ft. .05
1/8 Flat	17 Ft. .06
3/16 Flat	12 Ft. .07

Aluminum Wheels

1"	.08
1 3/8"	.10

Balsa or Hard Wood Wheels

1"	per pr. .05
1 3/8"	per pr. .06
1 3/4"	per pr. .10

Bushing free with each pair of wheels.

Bamboo

1/16 sq. x 12	dos. .03
1/16x1/4x15	1 for .01

Reed

1/16 o. d.	3 Ft. .02
1/8 o. d.	3 Ft. .03

Aluminum Tubing

1/16 o. d. per ft.	.07
3/32 o. d. per ft.	.07
1/8 o. d. per ft.	.10
3/16 o. d. per ft.	.11
1/4 o. d. per ft.	.14

Aluminum Sheets

010 6x6	.06
010 6x12	.10
010 20x28	.80

Aluminum Cowls
(Open face or prang ring)

2"	.18
3"	.27

Dummy Radial Engines

1 1/2"	.10
2"	.15
3"	.25

Ball Bearing Propeller Shaft

1/16 dia.	.35

Paulownia Wood Propeller

5"	.07
6"	.08
7"	.12
8"	.15
10"	.20

Thrust Bearings
Small, each
3c ..... dos. 15c
Large, each
5c ..... dos. 15c

Celluloid Sheet
2x6 ..... .02

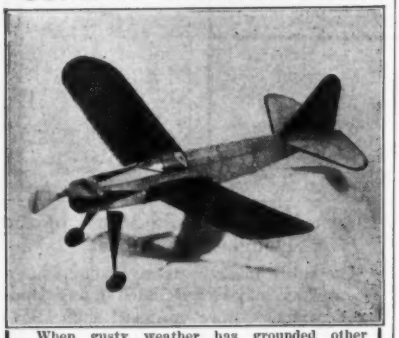
Model Pins ... Pt. .05
Dope Brushes ..... .05
Nose Plugs ..... .05
Wire 016 020 028
034 ..... 5 Ft. .02
Washers, small or
Large ... Per doz. .02

ORDERING INSTRUCTIONS
Free postage on all orders over 50c. Add 10c on all orders under 50c. Foreign orders add 15c.

1937 Model Aeronautics Year Book
This book contains more than 80 detail plans of champion and record models. Price .75 P. P.

BAY RIDGE MODEL AIRPLANE & SUPPLY CO., 232 45th Street, Brooklyn, New York

"COMBAT" PERFORMANCE



When gusty weather has grounded other models—sturdy 18" "Combats" are making their swift spiral climbs and riding strong up drafts.

If you desire brilliant performing models with "all weather" flying records, see your dealer or write for our catalog of kits and supreme quality supplies.

Combat kit $.50 plus $.10 Postage
Famous West Wind kit $1.00 P. P.

MONARCH MODEL AIRCRAFT CO.
4955 W. 113th Street Inglewood, California

BEMO GAS PROPS

MADE IN AMERICA
PRICED REASONABLE

Hand carved from selected Red Gum wood to specifications of the leading gas motors. True pitched and balanced. Propeller shaft hole centered and drilled. Propellers have a beautiful natural finish.

EVERY PROPELLER GUARANTEED SATISFACTORY OR YOUR MONEY GLADLY REFUNDED

Size	each	Size	each
13"	70c	16"	$1.00
14"	80c	17"	$1.15
15"	90c	18"	$1.35

Plus 8c postage

Complete line of gas motors including Forster, Mighty Midget, Baby Cyclone, Ohlsson, and Brown Jr. at nationally advertised prices and postpaid.
NEW ENGLAND MODEL BUILDERS examine our complete line at our Boston salesroom.
Send stamp for your 32-page illustrated catalog. A large assortment of supplies including gas material and over one hundred kits.
Dealers write for gas prop quotations.

BEMO AIRCRAFT COMPANY
77 Summer Street, (Dept. M2) Boston, Mass.

shape them out with your razor blade as shown by the cross-sections on the plans. Make the wing in two sections, a right and left wing panel. Cut grooves in the leading edge for the engine nacelles. Other parts of the model to be made are the tail units, the nacelles and cowls, the propellers, and the wing floats and struts. Sandpaper the parts thoroughly.

Then join the wing sections to the hull with model cement. Put blocks under the wing tips. Join the tail surfaces together and put on the wing floats. Cement the nacelles to the wing. Connect the props to the nose and begin the paint job.

Paint the top of the wing yellow and the bottom of the hull green. The rest of the model should be silver. Many coats will have to be applied before a smooth finish is obtained. When the paint has dried the model will be completed.

Air Ways Here and There

(Continued from page 22)

"With the advent of the miniature petrol motor, a new contest has commenced; the first heat for which was conducted by New South Wales recently, when eleven competitors participated. The over-enthusiasm of the large crowd of interested spectators, was responsible for the destruction of nine of these splendid machines. As these miniature aircraft, with their little engines developing one-eighth hp. and revolving at some 4,000 r.p.m. tore along the ground and into the air, the spectators would surge across the machines' path, little dreaming of the danger to be encountered from these swiftly spinning hardwood propellers. Disappointing to the builder of the machine, certainly, since many weeks of work and thought must have gone into his aeroplane. The novelty will soon wear off, however, and it is anticipated that the enthusiasm of the spectators today will have abated sufficiently to permit of more satisfactory performances from power-driven models in the future.

"It is of interest to note that a Parramatta lad, N. Jackson, has won the Angus & Coote Cup for 1936 after twelve months' consistent flying. The Anthony Hordern trophy was captured by Clifford Greentree of Wilberforce against nine other competitors. Greentree had won heats in January, February and August and lived up to his reputation as an expert model flier in also winning the finals.

"Every state in the Commonwealth has participated in these official contests during 1936, and although Queensland and South Australia have flown strongly, New South Wales has been able to hold its own. The times established throughout the year have been phenomenal for model aeroplanes flying under official conditions. Some of the most outstanding flights include 18 minutes, 30 seconds by David Lee in Albuory; 19 minutes from C. Greentree of Wilberforce; 21 minutes, 45 seconds by his brother, S. Greentree, and 14 minutes, 47 seconds by F. Millar of Queensland. Such flights as these, in comparison with those of the previous year, show an increase in performance of over 50%. Where once a member would be satisfied with a flight of say 45 seconds, today a flight of five minutes is taken quite casually.

"The active participation in these contests with such regularity, and under all conditions of weather, have forced the Australian model flier to adapt his model designs accordingly. Where once a competitor would arrive with one propeller for his single machine, today he enters the arena equipped with a number of different types of models, and a wide assortment of propellers and rubber motors to enable him to get the best results under whatever atmospheric conditions prevail on the flying field.

"The knowledge gained by this experience is not only creating and maintaining what the general public would call air-mindedness, but it is removing the air of mystery from normal mechanical flight in a way that nothing else could."

CLUB NEWS

Chicago, Illinois

We have some very interesting news from Carl Goldberg of 1240 Rosemont Avenue, Chicago, Illinois, who is president of the Aeronuts Model Club. He says:

"At two recent N.A.A. sanctioned indoor meets we held, the following times were made officially: Helicopters, Jr.; Alex Nekimken 2:07. Sr.; Dean Decker 1:49.8. Open; Myself 2:46.2. Autogiro, Jr.; Milton Huguelet 1:11. Sr.; Richard Obarski 2:26.5. Open; myself 0:54 (humiliating, eh what! I later got the stall out and did 2:18). Ornithopter, Sr.; Edmund Swort 0:33.2. We're planning an ornithopter meet soon and in preparation I've already done 64 seconds several times, and Leonard Elgenson, with an identical ship, 50 seconds. Since making those flights, we corrected the outstanding fault and are now getting an excellent climb. Barring very bad luck, we should raise the records to at least 1½ minutes.

"The club's contest program is a stiff one and is aimed at a goal of 25 National

records by the end of March. We already hold 9 and have 7 more awaiting homologation. Three more records are held by a Chicago boy whose working hours conflict with our meetings, making it impossible for him to be a member. Altogether, we intend to make Chicago the leading record-holding city. Philadelphia now holds that rank with 19 accepted marks."

Mr. Edward Lidgard of 8209 South Paulina, Chicago, confirms many of the facts given to us by Carl. He says:

"The Chicago Aeronut Club has recently broken six world's records. They are junior, senior and open classes for helicopters and autogiros. The highest helicopter time was about 2 minutes, 45 seconds. The autogiro time was about two minutes."

Mr. Lidgard himself came within two seconds of the new helicopter record of 1 minute, 49 seconds with a flight of 1 minute, 47 seconds. Most of the autogiros were microfilm-covered and had wings and large tails. Also most of them had a wingless single rotor system with three vanes. However, Lidgard had a double rotor system of three vanes each which flew very stably.

Boston, Massachusetts

Recently members of the Jordan Marsh-Boston Traveler Junior Aviation League broke four Boston indoor records. The results of the contest are as follows:

Gliders

1.	Tyler A	35.8 sec.
2.	Sampson B	33.8 "
3.	Capo B	32.8 "

Stick H.L.

1.	Capo B	12:23.8
2.	Golden B	10:07
3.	Tyler C	9:43.2

Stick R.O.G.

1.	Phillips B	12:26.6
2.	Capo B	8:26
3.	Shea B	8:18

Flying Scale Models

1.	MacLean—Rearwin	:47
2.	Avola—Monocoupe	:36.8
3.	Hannon—Taylor Cub	:34.2

The new Boston records are as follows:

	Gliders H.L. Indoors:	
Cl. A	Senior—Tyler	:35.8
	Gliders H.L. Indoors	
Cl. B	Junior—Sampson	:33.8
	Gliders H.L. Indoors	
Cl. A	Junior—Sampson	:33.
	R.O.G. Stick type	
Cl. B	Senior—Phillips	12:26.6

Other events were:

Helicopter	Jr.—Sampson	1:24
Ornithorpter	Sr.—E. Whitten	.04

Syracuse, New York

Mr. Charles Birdseye, president of the Syracuse Model Airplane Club of Syracuse, New York, wishes to announce the following changes in the club officers, due to the recent elections: president, Charles Birdseye; first vice-president, Jean Chadwick; second vice-president, William Rogers; secretary, Gordon Wheler; treasurer, Robert Dillman; club advisor, Ira Fralick.

"We would also like to make public the announcement of an exhibition scale model contest to be run off strictly in accordance with N. A. A. rules on Saturday, February 27. Anyone interested may write me for details at 101 Lincoln Avenue, Syracuse, New York."

Akron, Ohio

Mr. James Weber, secretary-treasurer of the Akron Model Aircraft Club of 653 North Howard Street, Akron, Ohio, writes as follows concerning his club:

"It was organized on December 17, 1935. Since that time many contests have been held, the winners being awarded kits, supplies, magazines, etc. Meetings are held once a week. The names of the club members are: Ed Voorhees; Pershing Kaufman, president; Elton Boyer; Hugh Smith; James Weber, secretary-treasurer; and Wesley Peters.

"We would appreciate correspondence

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The Lustrous New Metal For All Model Builders

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This new model makers' metal is exceptionally pliable—easily formed with the fingers to fit the contours of your models. Model cement holds it firmly in place. A pointed stick—or lead pencil is the only tool you need for recessing or embossing windows, doors, portholes and other details.

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2 sets 60c Postpaid U. S. A.

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F 38	Art Chester Racer	F 44	Brown B3
F 39	Curtiss Coupe	F 45	Aeroneer
F 40	Vultee V-11	F 46	English Puss Moth
F 41	Fairchild 24	F 47	Fokker D 8
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F 43	Boeing F4 B4	F 49	Spad

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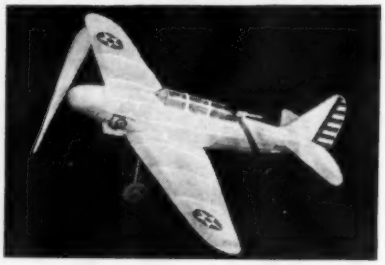

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No. 60 Twelve Inch Model
New Laminated Construction
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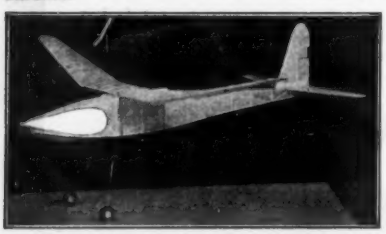

AERO GLIDE—Wingspan 41", length 30", wt. 3 oz. Kit contains all parts to assemble folding propeller—MAMCO BALL BEARING propeller shaft—M & M model wheels—special brown contest rubber motor—glue, dope, tissue, wing ribs and other parts printed on "AAA" sheet balsa—all strips cut to size—full size detail 3-view drawing.

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Span 30", Length 25", Wt. 2 oz. Kit contains full size plans, wing ribs notched and cut to shape, body formers and other parts clearly printed on "AAA" balsa, turned spinners, glue, dope, red tissue, rubber motor, special designed real FREE WHEELING PROP. CUT TO SHAPE. WORKS perfectly every flight. This model has ALTITUDE-SPEED-ENDURANCE and a perfect GLIDE, with M & M Airwheels for SMOOTH LANDINGS.

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from any builders or clubs. All letters should be addressed to me at the above address."

Toledo, Ohio

At Toledo, Ohio, the Junior Aviators held a speed contest in the Civic Auditorium recently. At the time of going to press no definite news has been heard concerning the results of the contest. They will appear later. Mr. Charles Tracy, who oversees the activities of this Toledo group, writes as follows:

"Everyone remembers the last contest when Chuck Smith, Bob Jeffrey, Bob Chatelain, Lawrence Mueller, Robert Stroud, Ray Stribrny and many other fellows entered models which set terrific speed marks close to 70 miles an hour!

"The models had a wing area of at least 50 square inches. That is, any model with less than 50 square inches was not flown in the competition. All fellows under 16 years of age were in the junior division and those over 16 were in the senior division. Prizes of model supplies, books, Junior Aviator pins, etc., were given the winners.

"The events were sponsored by The News-Bee and the City Recreation Department."

Gas Lines

(Continued from page 73)

has been built with the greatest of care, including all details. We frankly state that the picture does not do it justice. The fuselage was built of United States Navy tested spruce, longerons being ¼" square. All joints were drilled for nailing with rust-proof brads, then cemented. The wing ribs and fuselage fairing are of hard grade balsa. The ship is covered with Japanese silk and is powered with a Brown Junior engine. The curved wing tips and rudder outlines were formed with aluminum tubing. Even the stabilizer may be adjusted by means of a worm gear shaft set in proper bearings which connect with a short length of brass tubing fitted to the moment arm of the stabilizer. A wire crank is soldered to the worm gear screw. In this manner the stabilizer may be operated. There are many other details which are equally interesting. Mr. Collins will be pleased, we are sure, to supply these to readers who would like to know more about his ship.

The ship recently was given a test hop with one pint of gas in the tank, which fitted into the passenger compartment. This took place at Muroc Dry Lake. The ship took off nicely but slowly with its heavy load. The climb was very gradual at first, but it finally gained altitude rapidly and was soon lost to sight. However, it reappeared again and eventually came back to earth, having been in the air for over thirty minutes. The highest altitude reached, as closely as could be estimated, was 300 feet. The ship required 600 hours of construction. (After putting this much work in a model it required a brave man to fill up the gas tank.)

An interesting picture of a scale gas job of "Mr. Mulligan" has been sent to us by Sanford Capron, which is shown in picture No. 3. This little ship was built by Bill Slaughter and Capron, who live at 306 Georgina Avenue, Santa Monica, Calif., and 407 Euclid Street, Santa Monica, respectively. The ship has a wing spread of only fifty-two inches and weighs 3½ pounds complete. Powered with a Brown motor it is an excellent flier.

The Cavalier gas model is one of the finest-looking jobs that has been produced. Aerodynamically it is highly efficient. As far as stability is concerned, sometimes this quality is not all that would be desired, due to the close arrangement of the flying forces and a lack of pendulum effect, which would be produced by a parasol wing.

A very fine example of this plane is shown in picture No. 4. It is being held by John Pond of 435 14th Street, San Francisco, Calif., who constructed it. This ship has made some very excellent flights. Pond has built several gas jobs; a Corben Super-Ace, one of his own design and a Corben No. 1. This last model was sold before Pond had a chance to fly it. His second model, designed by himself, was lost at a contest after a flight of forty-five minutes, at which time it passed out of sight over San Francisco Bay. A reward was offered through advertising and radio broadcasts but the ship was never found. Pond's Cavalier, shown in the picture, weighs 4½ pounds.

The Omaha Gas Model Airplane Association of 3119 Ames Avenue, Omaha, Nebraska, which is unit No. 19 of the I.G.M.A.A., recently held a meet. Picture No. 5 shows three of the models in the contest resting on the airport. From left to right, the ships were built by E. R. Lane, Fred Wilke and Dick Watt. Watt's ship was unfortunately wrecked during the contest.

The new club members are: Jack Furstenberg, Harold Hansen, Robert Manoli, Ray Olinger. We are indebted to the club secretary, Don Negathon, for this information.

Ed Manning of 411 East Scott Avenue, Knoxville, Tennessee, sends us picture No. 6, his first gas job. From an examin-

ation of its structure we would say that Manning is an experienced model builder. This swell job is being powered with an Elf engine. In the wing, monospar construction is used and ¼" aluminum tubing is used for the landing gear struts. The wing struts and leading and trailing edges of the surfaces are also of aluminum tubing.

Manning also sends us the pleasing news that the Knoxville junior chapter of the National Aeronautic Association is joining the I.G.M.A.A. as a unit.

Just to show that men do not have things all their own way, we present picture No. 7, which shows Mrs. C. H. Stagg of 6047 North 3rd Street, Philadelphia, Pa., ardent gas model fan, holding the gas model which she built. It is powered with a Brown Junior motor. To date she holds all the women's records in the Olney Gas Model Airplane Association of Philadelphia.

Mrs. Stagg says she would like to see a women's contest at one of the I.G.M.A.A. meets. This will be arranged as soon as there are enough women members who can attend contests. We suggest that Mrs. Stagg get busy and enroll a few future contenders of her sex.

Picture No. 8 is sent to us by J. R. Edwards of the Model Aeronautical Research Club of 130 D Street, Salt Lake City, Utah. It shows Mr. Edwards in hasty pursuit of his Corben Super-Ace gas job just after a take off. Mr. Edwards is one of the organizers of the Research Club, of which Mr. Harry Mori is president. He says they consider Mr. Mori one of the finest builders in the country. Mr. Bob Johnston, the vice president, recently left to take his Masters degree in Aeronautical Engineering at California Tech. Dick Carlisle is secretary and Mr. Edwards is purchaser and secretary during Mr. Carlisle's absence.

He tells us he believes that they have one of the most perfect gas model flying fields in the country, the famous "Bonneville Salt Flats" near Salt Lake. A unique feature of this field is that the surface is slightly flexible which makes crack-up damage slight, as a rule. We should indeed like to see such a place. One might imagine that in running after models on such a flexible surface that one could make exceedingly large jumps. Sort of a bouncing flying field, so to speak.

The old KG seems to be a favorite standby and it has come to life in many sizes and forms throughout the world. Here we have a picture of an Elf-powered KG-3, shown in picture No. 9, built by Lowrie McLarty of Kendersley, Sask., Canada. A unique thing about this plane is that it has only about 200 square inches of wing area; a very small plane as you can see. It sports a 6½ inch propeller and weighs, ready to fly 13½ ounces. The speed of the ship is about twenty miles per hour. McLarty says:

"People call the KG-3 an 'ugly duckling' on the ground but in the air it has a beauty all its own."

This may be due to its steadiness of flight rather than its symmetry of form.

Frederick Pilcher, Jr., of 718 Fifth Street SW, Rochester, Minnesota, sends us picture No. 10 of his five foot span,

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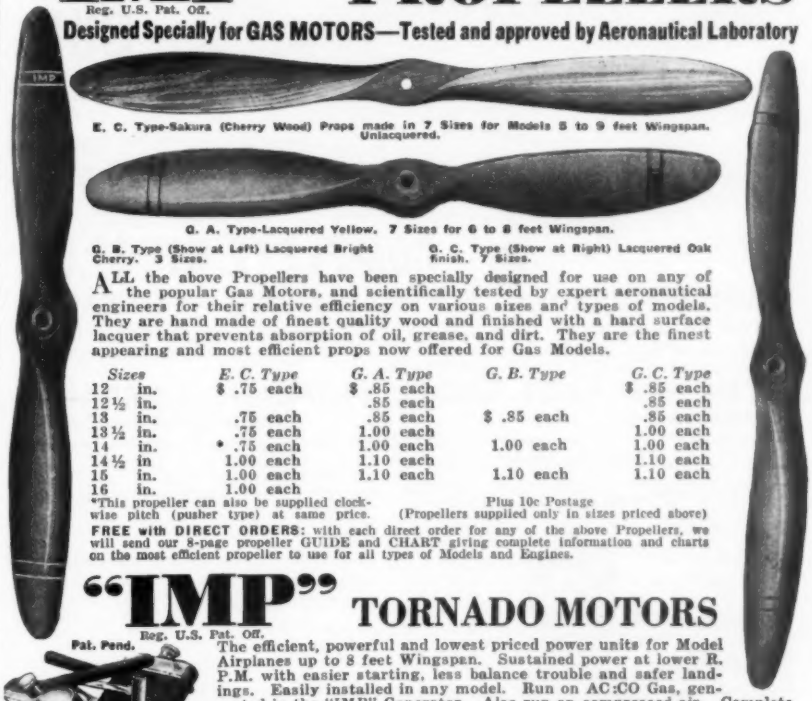
Designed Specially for GAS MOTORS—Tested and approved by Aeronautical Laboratory



E. C. Type-Sakura (Cherry Wood) Props made in 7 Sizes for Models 5 to 9 feet Wingspan. Unlacquered.

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G. B. Type (Show at Left) Lacquered Bright Cherry. 3 Sizes.

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ALL the above Propellers have been specially designed for use on any of the popular Gas Motors, and scientifically tested by expert aeronautical engineers for their relative efficiency on various sizes and types of models. They are hand made of finest quality wood and finished with a hard surface lacquer that prevents absorption of oil, grease, and dirt. They are the finest appearing and most efficient props now offered for Gas Models.

Sizes	E. C. Type	G. A. Type	G. B. Type	G. C. Type
12 in.	$ .75 each	$ .85 each		$ .85 each
12½ in.		.85 each		.85 each
13 in.	.75 each	.85 each	$ .85 each	.85 each
13½ in.	.75 each	1.00 each		1.00 each
14 in.	* .75 each	1.00 each	1.00 each	1.00 each
14½ in	1.00 each	1.10 each		1.10 each
15 in.	1.00 each	1.10 each	1.10 each	1.10 each
16 in.	1.00 each			

*This propeller can also be supplied clockwise pitch (pusher type) at same price.

Plus 10c Postage (Propellers supplied only in sizes priced above)

FREE with DIRECT ORDERS: with each direct order for any of the above Propellers, we will send our 8-page propeller GUIDE and CHART giving complete information and charts on the most efficient propeller to use for all types of Models and Engines.

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Model S-2 2 Cylinder. Weight 2½ oz. for Models 3 to 6 feet. Complete with Generator Feed Line and Safety Clip $5.00

Model V-4 (shown here) 4 Cylinder. Weighs 3½ oz. for Models 4 to 8 feet. Complete with Generator. Feed Line and Safety Clip $7.50

FREE with each S-2 Motor—one 12" Heavy Duty Propeller—Value 90c.
with each V-4 Motor—one 15" Heavy Duty Propeller—Value $1.10
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1½" Scale

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This kit contains all materials—Cements, finished turned balloon balsa wheels, drilled noseblock, full size plan, four sheets colored tissue. Send three cent stamp for latest catalogue No. 6.

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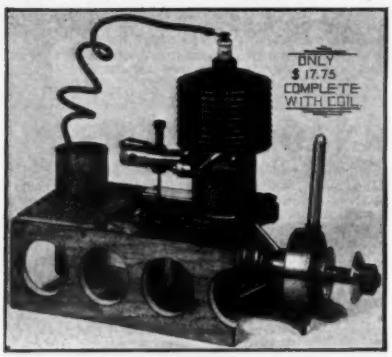
Little Hercules Leads In Modern Design



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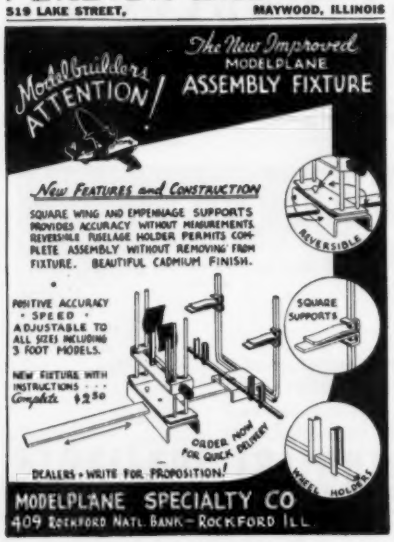
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The New Improved MODELPLANE ASSEMBLY FIXTURE
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SQUARE WING AND EMPENNAGE SUPPORTS PROVIDES ACCURACY WITHOUT MEASUREMENTS. REVERSIBLE FUSELAGE HOLDER PERMITS COMPLETE ASSEMBLY WITHOUT REMOVING FROM FIXTURE. BEAUTIFUL CADMIUM FINISH.
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DEALERS - WRITE FOR PROPOSITION!
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409 ROCKFORD NATL. BANK - ROCKFORD ILL.

Brown-powered, gas job. The Brown motor runs very nicely in an inverted position. The weight of the model is 2¾ pounds. Pilcher says:

"This model has been flown on repeated occasions in sub-zero atmosphere. If we waited for warm weather in this part of the country there would be only two or three months out of the year for flying."

He does not seem to have any trouble in starting his motor under these conditions.

Mr. Gene Stephens is from Missouri, so he believes in showing others what his models will do. He therefore sends us picture No. 11, of his ten foot KG-3 taking off. As customary with the KG, his ship was climbing steadily and on a level keel when the picture was taken. Mr. Stephens lives at 1831 West Main Street, Jefferson City, Missouri. He tells us that the ship is powered with a Forster Brothers ⅓ hp. motor. So far it has made about fifteen flights, ranging up to five minutes' duration, depending upon the amount of fuel in the tank. On one of these flights the plane climbed to an estimated height of 300 feet when the motor cut out. A flat glide, terminating in a cornfield, ended the flight. He says:

"I have had only minor crack-ups so far and with a little more experience in handling gas models I should get some record-breaking flights from this remarkably stable ship."

One of the finest gas jobs we have seen is shown in picture No. 12. This ship was designed and built by James E. Smith of 1605 Vance Avenue, Chattanooga, Tennessee, who is president of the Chattanooga chapter of the Junior N.A.A. Mr. Smith says his model is exceedingly stable, even on its test flights. The wing span is six feet, six inches; the chord 10½ inches.

The Chattanooga Club has eleven members, all of whom are active fans.

A very active group which has kept its light under a bushel is the gas model group of the Westchester County Model Airplane Club. About a year and a half ago they built a KG, powered with a Forster Brothers engine. The ship is shown in picture No. 13, just before its first test flight. Your editor had the privilege of seeing this ship at one of the club meetings and stated that the club members did a very beautiful job of construction. Great care was put into every detail.

Picture No. 14 illustrates the predicaments into which gas jobs can involve gas model fliers. This picture was taken after the first test hop of the club plane. It landed very gently, though unfortunately, in the tops of some trees along the airport. One of the club members may be seen playing the part of "monkey" in order to retrieve the model. It was necessary to dismantle it while perched in the tree in order to get it to the ground without damage. Since this incident occurred the members have become wiser and use less gas. Some excellent flights have resulted.

Mr. J. Grieve of 81 Pasco Street, Williamstown W. 16, Victoria, Australia, secretary of the Southern Model Flying Club, sends us picture No. 15. It shows Mr. S. Ditchburn, president of the club, with his first gas job, a KG-3. The machine, complete, weighs six pounds and is powered with a Tlush Super Ace motor. Slight damage resulted during its first test flight due to a very heavy and gusty wind. However, since that time some very excellent flights have been made.

Frank Ropes of 220 Silver Avenue, Hillside, New Jersey, tells us that there are only three gas model builders in his vicinity, of which he is one, but these are very active. He is most anxious to form a club and if local builders wish to join these activities they should get in touch with him at the above address.

Dick Johnson of 707 Thilihgen, Los Altos, Calif., sends us an interesting note. He says he is using a mercury switch which cuts the ignition of his engine if the ship goes into a spin. It consists of a tube corked at either end: wires of the ignition passing through the corks and contacting the mercury which half fills the tube. In a spin the mercury flows to one end, breaking the circuit.

By this you can see that many young men are still using their minds.

Mr. Betram Heflebower, Jr., of 1440 Lunalilo Street, Honolulu, Hawaii, has written us an interesting letter. It apyears that the gas model bug has struck that community. He says they have been very active with gas models but he has found it difficult to get a club started. At present there are about twelve gas models on the island. However the builders do not seem inclined to get together.

Mr. Heflebower has built three gas models and is now planning a fourth.

We have just received a letter from Mr. Earl F. Baker of 208 South King Street, manager of the Hobby Store. He has formed the Honolulu Gas Model Association and registered it under the I.G.M.A.A. We suggest that gas model builders get in touch with Mr. Baker and join his unit. Next month we will print an outline of the constitution and by-laws of this club, which can serve as an example for other clubs if they so desire.

The Central Gas Modelplane Society of Chicago, Illinois, intends to hold a gas model exhibition on March 12, 13, 14, in the convention hall of the Hotel Sherman of that city. The show will consist of an exhibition of gas models, motors and accessories together with an exhibit of gas model photographs and a continuous "movie" of the society's activities. About noon on the opening day there will be a parade down State Street consisting of at least ten models, with motors running, on the tops of cars. Following this parade the models will be returned to their respective booths and the show will go under way. There will be about thirty models in this exhibit. It is suggested that gas model builders in the vicinity of Chicago attend the show for they will see many things of interest.

Mr. P. J. Sweeney is president; S. Harper, Jr., vice-president and J. V. Moffitt is secretary.

Bob Hamfeldt of 648 James Street, Utica, New York, writes and tells us that they have a real live organization of gas model builders, which is about six months old. Most of the builders are members of the I.G.M.A.A. There have been three ships flying in Utica and six models are now being constructed.

NEW UNITS

Beloit, Wisconsin

One of the new units of the I.G.M.A.A. is called Hangar 13 with headquarters at the Y.M.C.A., Beloit, Wisconsin. It has a membership of over 50 and boasts of fifteen gas models started or already completed in the club. Twice a month the club has regular flying at the Rock County Airport unless there is more than six inches of snow or the atmosphere is below thirty degrees.

San Diego, California

On April 4th, 1937, the Aviation Advancement Club and the San Diego Gas Model Club (Unit 18 I.G.M.A.A.), will hold their second annual gas model contest. Last year's contest was sponsored by the A.A.C. alone; this year the recently formed San Diego Gas Model Club is cooperating to make this meet the finest yet held in this vicinity.

The meet is unique in that it is to be a precision-consistency contest. This means that consistent fliers, able to make more flights than the balky ships, will be able to total more points because of special rules.

Gas model flying has arrived at a point where a person who has a reasonably good ship can send the ship out of sight at will. The reason for the precision type contest is to increase interest in the flying qualities of the ship, rather than duration.

The contest committee is headed by S Phillips Andrews, director of the San Diego Gas Model Club; and consists of Howard V. Miller, president of the Aviation Advancement Club; Daniel S. Halacy, secretary, A.A.C.; Jack deV. Emery, A.A.C.; and Robert Holland and Ellot Davidson of the S.D.G.M.C.

The contest will start at 7:00 A.M. at which time the models will be judged for appearance. At 8:00 A.M. flying will begin. Contestants will be called numerically by their registration numbers and given a specified period of time to start. If one fails to start the next contestant is called, etc. Models will be judged on take-off, flight, landing and other qualities. Flying will end at twelve noon at which time the judges will decide the winners. During the tabulation of results, exhibition flights will be made by club members. Prizes will be cash awards, trophies, medals and merchandise. Prizes will be awarded on the field.

Admission will be charged to the field as the two clubs are putting up the cash awards themselves.

All model builders are eligible to enter. Entry blanks may be obtained by writing D. S. Halacy, Secretary, Aviation Advancement Club, 4937 Vista Place, San Diego, California.

Jackson, Michigan

Pete Dillon of West and St. Clair, Jackson, Michigan, writes and tells us that he and several other gas model fans have just formed the Jackson Gas Model Club. At present there are only five members. Though this may seem small it may be explained by the fact that membership is limited to those owning either a motor, a plane or both. In this way it is assured that only those who are actively interested in gas models will be members of the club. We will look forward to hearing more from this active unit.

New York City

On January 29th the Metropolitan Model League of 421 Seventh Avenue, New York City, I.G.M.A.A. Unit No. 7, held its annual model convention. It was attended by about eighty members, as well as a number of friends of the club. Various phases of gas model activities were discussed although no definite conclusions were reached concerning fuel allowances, which was the chief topic of interest. Mr. C. H. Grant was the guest speaker and gave a brief talk on problems of model aviation and points that seemed to bother a large number of the fans. Outstanding of these was the problem of designing propellers for gas jobs.

At the end of the talks and discussion, moving pictures were shown of the first test flights of the KG, designed by Mr. Grant and built by Joe Kovel. Pictures in color which were taken at the 1936 "Nationals" were also shown. These were unusual, especially as they were in

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● **MODELCRAFT engineers represent some of the best, most experienced in the country. Their experience plus thousands of flights, plus complete testing of a model before putting up a kit, assure you of the best in gas models regardless of price.**

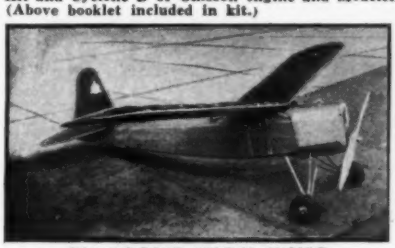
For those who would like information on construction, balancing, test flying, covering, adjusting, wiring, trouble-shooting, etc., we have prepared a booklet obtainable at your dealer or from us, price 50c

1937 GAS MODELS AND ENGINES

NEW PACIFIC ACE

Wing span 60 inches. Beauty, Performance Glide, Fast Climb, and real ability to take "it." 127 test flights, 66 with Cyclone B; 61 with Ohlsson, all with ONE ship. Stability PLUS, no model regardless of price can equal this 1937 Ace.

Can be powered with a Cyclone, Brown, Ohlsson, etc. Kit contains special gas model Balsa, dope, cement, air wheels, silk, hook-up wire, switch, propeller, bolts, music wire, full-sized plans..... $8.50 Prepaid
Kit and Cyclone D or Ohlsson engine and Modelcraft $1 Battery ..... $25.00 in U.S.A.
(Above booklet included in kit.)



54" SCOUT HIGH WING

NOTE: Special Cowl as shown (not in kit)—Extra $1.50.

60" SCOUT LOW WING

The Scout was designed to give real performance to the smaller engines, such as Cyclone, Tom Thumb, Rossi, Mighty Midget, etc. Easy to build, fast climb, real flights, none of the saggy, wavering flights of a under-powered model. Four ships are shown on the plans; 48, 54, and 60 inch high wings, and a 60 inch low wing that flies. Any one may be built from the kit. Kit contains plenty of extra hard balsa, gas model cement and dope, music wire, motor mounts, aluminum sheet, bolts, nuts, switch, hook-up wire, full sized plans, silk and air wheels

$7.25 Prepaid in U.S.A.

Same kit with Whitfield's bamboo paper and rubber "do nut" wheels $4.85 prepaid in U.S.A.

ENGINE SUPPLIES Cyclone and Ohlsson engine and parts, Ohlsson wheels, cowls, propellers, AC plugs, silk, bamboo paper, special batteries, pinked tape, straight wire, aluminum tube and sheet, 3½ inch air wheels, $1.25, etc., a complete line of gas and rubber model supplies. Write for *FREE* circular. Shipments made same day order received.

DEALERS: *Liberal Discount on Engines, Kits and Supplies. Use Letterhead for New Wholesale List.*

A recent contest showed first, second, fourth place winners and 80 per cent of entrants built their ships with supplies from

The LEADING MODEL SUPPLY HOUSE OF THE WEST.

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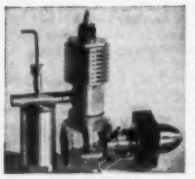

THE "BRAT"

Announcing the sensational small motor—the "BRAT"—bore 17/32", stroke 5/8". Runs 8 min. on ¼ oz. of gas. Weight 3⅓ oz. (Flying weight, with batteries, coil and condenser—8 oz. complete.) Height 3 in. 1/10 H.P.—3000 to 7500 R.P.M. with 9" propeller.

The "Brat" is the result of a year's experimentation by expert engineers, and is absolutely guaranteed to run perfectly. It is designed to fly models of 3 to 4 foot span, weighing 1 lb. to 1½ lb. It has been thoroughly tested in many models before being released, and is perfect in detail. The "BRAT" saves you ½ the cost and work on your gas model, and due to the small size of the model makes transporting much easier. Order your "BRAT" now! Orders will be filled in the order which we receive them! The "BRAT" complete with coil, condenser, propeller and spinner completely tested and run in at the factory is only..... **$16.50** Post paid

WE STOCK ALL THE MOTORS LISTED BELOW FOR IMMEDIATE DELIVERY!

1937 BABY CYCLONE—$17.25 1937 GWINAERO—$17.50
1937 MIGHTY MIDGET ASSEMBLED—$17.50
1937 MIGHTY MIDGET KIT—$9.85
OHLSSON MOTOR—$18.50 BROWN JR.—$21.50
CLEVELAND TOM THUMB—$17.50—KIT—$9.75

FREE! with Every Assembled Motor a FREE PROPELLER

PROPELLERS—Most efficient gas model propellers on the market! Make your ship perform better—FINE—12", 13", 14"—$1.00. MAHOGANY—12", 13", 14"—$1.25.

COILS—real "firecracker" coils—for any motor—$2.10. Send 3c stamp for catalogue of gas model kits, motors, supplies

CALIFORNIA BUYERS!—PLEASE ADD SALES TAX.

THE FAMOUS DENNY JR.
—1 HR. 47 MIN. GAS MODEL

Span—6 ft. Weight—complete with motor—3 lbs.

Here is a model that will give you everything you want in a gas model!—Looks! Strength! Light weight! Real performance! The Kit for this famous model is complete in every detail—real air-wheels, finished aluminum cowl, cut-out ribs, ½ pt. cement, 1 qt. dope, silk covering, as well as plenty of wood, metals, etc., to build the best looking, finest performing gas model you ever saw! Complete kit with full size plans and instructions..... **$10.00** Post-paid

Plans, wing ribs and spars only..... $3.75

HERE IS A REAL SPECIAL!—DENNYPLANE JR. KIT and GWINAERO or MIGHTY MIDGET Motor—all for $25.00! You save $2.50!

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FOR REAL FLIGHTS

CADET MAJOR—CADET Jr.,

Span 30" Area 102 Sq. In. — Span 20" Area 45 Sq. In.

Here are the two greatest performers ever designed for Model Builders. Thousands have been sold and from everywhere come enthusiastic reports on their Prize Winning flights.

Why experiment with unproven models when the Cadet Major and Junior guarantee you Championship performance.

Why jeopardize your chances of winning . . . when these famous models have so many wins to their credit. *Line up with a Champion! Fly a Champion! Win with a Champion! Order your Cadet Major or Junior today.*

CADET MAJOR Kit	Postpaid $1.50
CADET Jr., Kit	50c Plus 10c Postage
Both Kits, Postpaid	$2.00

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British Agents: Model Supply Stores 46 Derby Rd., Prestwich, Lancs., England

color and showed many of the highlights of the contest.

NOTICE

Any unit interested in obtaining moving pictures of gas models which they may run before their club should write to I.G.M.A.A. headquarters, 551 Fifth Avenue, New York City. Steps are now being taken to determine where pictures of this nature may be obtained for use by units. It is possible that there will be a small charge required for this service and to cover postage.

Wichita, Kansas

Another new unit, No. 37, has been formed at 215 North Dodge, Wichita, Kansas. Mr. Leo Rutledge, whom many readers of "Gas Lines" will know as an instructor of model activities, is sponsor. Donald Sump is president and Fred Just is secretary and treasurer. The club is composed of twenty-seven members.

Unit No. 35 has been formed at 209 Madison Avenue, Memphis, Tennessee, under the leadership of Hubert Owens. There are seventeen members at present.

Unit No. 36 is in far-off New Zealand. It is the Canterbury Gas Model Aero Club of 14 Hillgrove Street, Christchurch, New Zealand. The president is C. E. Smith and N. Mason is secretary. At the present time the club is busily working on ships which they expect to fly shortly. Two of the members are model engineers who are working on motors so they hope to have local engines at their disposal as well as imported ones. The membership is as follows:

C. E. Smith, N. Mason, L. Wood, N. Ayers, V. Gunther, R. Cashmore, B. Ayers, N. Gray, B. Dacombe, F. Wood, V. Long, S. Smith, B. Bull, J. B. Crawford, G. Clarke, W. Ayers, H. R. Head, H. Gibson.

Pins

The I.G.M.A.A. pins are all ready, so we suggest that all members send their twenty-five cents in to headquarters immediately before the supply runs out as a limited number has been manufactured. Will unit leaders please take this matter up at their next meeting?

NOTICE

We have some heartrending news from George A. Neil of 39 East 12th Street, Huntington, New York. It seems he lost his gas model at the Hadley Field contest held last fall. He says:

"It had I.G.M.A.A. license No. I.G.M.-O-63-2. It was powered by a brown Junior No. 73 and had a silver fuselage with a red wing. The model was a monoplane of the parasol type."

Will anyone hearing of this model kindly send word to Mr. Neil or I.G.M.A.A. headquarters immediately.

UNIT NEWS

Philadelphia, Pa.

We hear from William Berry of 951 East Price Street, Philadelphia, Pa., head of I.G.M.A.A. Unit No. 15 that this group is flying regularly due to the mild weather. Bob Ayars' new six foot plane had a flight recently of over ten minutes, and landed ten miles away.

Pittsburgh, Pa.

We hear from our "steam roller," Bob Allen of 7401 Frankstown Avenue, Pittsburgh, Pa. He is our western Pennsylvania director and head of Unit No. 3. He says:

"Our contest for exhibition purposes turned out to be a wow. We had sixty fine models out and what a time the judges had to pick the winners. We had to add four more prizes to satisfy the judges and then they wanted to give more. All in all, we had seven prizes; first, Brown Junior engine; 2nd, Tom Thumb motor kit; 3rd, subscription to MODEL AIRPLANE NEWS, and then we added four long airplane rides from the Butler Airport, which incidentally is our official airport for contests and testing purposes. They really work with us out there and have actually barred any model without a license.

"Two of the district's best liked and most popular pilots acted as judges, Mr. Bob Piper and Mr. Harvey Werling. The results were:

"Tom and Vince Fisher of 1936 Lowrie Street, Pittsburgh, Pa., won with a revamped and dressed up Flying Quaker. Edgar Fulmer of 324 Russellwood Avenue, McKees Rocks, Pa., was second with a ship which was his own idea of a real gas endurance model. Third place went to Larry Rosenson of 3857 Beechwood Blvd., Pittsburgh, who had a beautifully decorated Flying Quaker. James McCoy of 1031 Glenn Street, Wilkinsburg, Pa., was fourth with a Zephyr. Dick Everett of 164 Lawrence Avenue, Washington, Pa., had an Elf powered job and he won fifth place. Sam Poole of 400 Motheral Avenue, Monessen, Pa., was sixth with a nice rendition of the California Chief. Robert B. Shane of 310 Mayfield Avenue, Pittsburgh, was seventh. He had a Miss America model.

"These models are to be on display for a solid week and I believe they will do much toward education of the 'masses.' I do know that there have been about 5000 people who took time to look at them very closely."

QUESTION AND ANSWER DEPARTMENT

It appears that a new department of "Gas Lines" is becoming a necessity. A great many questions are coming in concerning designing, building and flying gas

Cash in on Your Model Building Ability!!

Big Building Contest — Win a Scholarship or $1500 Cash — 100 Prizes in all!

$2850. in Prizes!

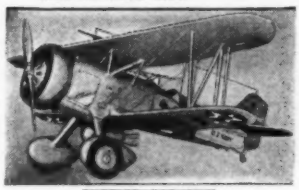
The Rules Are Simple

1. Contest is open to everyone.
2. Official Entry Blank must be filled out and mailed.
3. Contestants may incorporate as much detail as desired.
4. Preliminary judging will be from photographs submitted by contestants. Such photographs will not be returned. Name and address of contestants must be shown on back of photographs. The judges will select 100 models from these photographs, which in their opinion attain highest rating. The 100 selected will be asked to send their models to Schenectady, N. Y., for final judging. Models must not be sent tmtil requested.
5. Contest opened Nov. 1, 1936, and closes August 1, 1937.
6. Prizes will be awarded on a basis of general accuracy, detail and quality of workmanship.
7. Models which are awarded 1st to 6th prizes inclusive are to be and become the property of Mohawk Model Planes & Supplies. All other models will be returned to contestants.
8. Judges to be selected by the Mohawk Model Planes & Supplies. Decision of the judges as to all matters is to be final.

Get into this Model Plane Contest! Here is a real opportunity for you to win a valuable award . . . . go to any College or University you desire—study Aviation in any school—or earn actual cash for any purpose you wish. There are 100 Prizes for those who build the best models. Read the list of awards: 1st and 2nd awards are Scholarships in Aeronautics at the University or College of winner's choice, or the cash, which is, 1st award, $1500; 2nd award, $750; and 28 other cash prizes; 3rd, $50; 4th, 5th, 6th, $20 each; 7th, 8th, 9th, 10th, $10 each and 11th to 30th, $5 each —also 70 Martin Bomber Model Kits, value $3.50 each, a total of 100 prizes. In case of ties, duplicate awards will be made.

Build These Models and Earn a Prize!!

You have two models to choose from, a Boeing P26A or a Curtiss Goshawk (both illustrated below), or you may buy both and enter both. Each kit $2.00 and 10c for mailing. (25c West of Miss. River.) **A Tru-Cut Knife is packed in each Contest Kit FREE.** Order yours now. Complete rules, entry blank, and full information in each Kit.



CURTISS GOSHAWK
Wingspan 23¾", Lt. 16¾", Wt. 3⅜ oz. Exact ¾" Scale.

ENTER NOW!

BOEING P-26A
Wingspan 21¼", Lt. 18", Wt. 2½ oz. Exact ¾" Scale.

MODEL CLUBS
Special features for Clubs interested in this Contest. Send for your Contest Kit now and ask for complete details.

Send this Coupon for Your Official Contest Kit!

MOHAWK MODEL PLANES & SUPPLIES
P. O. Box 604 Schenectady, N. Y.

Please send me.....IDEAL Official Contest Kit(s). I am enclosing $2.00 for each Kit, plus 10c for Post. West of Miss. River 25c.

Print Name .....

Address .....

City .....

State .....

model planes. Therefore a question and answer department will be included.

Howard J. Rosan of 1955 Sedgwick Avenue, New York, New York, has a number of questions concerning the design of a wireless-controlled gas model, about which he asks in a recent letter. He says:

"The motor will operate a generator to provide the energy necessary to move the controls."

Question: Do you think it practical to have a motor-driven generator?

Answer: No, for the simple reason that the speed of the motor might vary and fluctuation in the current would result. Batteries should be used.

Question: If such a generator could be used, would 1/5 hp. be enough or do you recommend more?

Answer: One-fifth horsepower would not be enough power in a radio-controlled plane. The weight of the radio at present makes it necessary to build a fairly heavy ship which would weigh, with radio, approximately ten or twelve pounds. One-third or one-fourth horsepower engines would fly such a ship.

Question: How much weight can such a plane lift?

Answer: It is advisable that the plane weigh not over twelve pounds. If the plane weighs seven pounds, including motor, there would be a balance of five pounds for the radio.

Question: What airfoil would you recommend?

Answer: Any high lift airfoil would be suitable. The Grant No. 3, used on the KG, has proven itself to be an airfoil suitable for this purpose inasmuch as it gives a high lift and slow speed. The Eiffel No. 431 would also be suitable.

Question: Would air wheels and shock absorbers make the landing "soft" enough?

Answer: Yes, provided these things are used in a suitable manner.

Question: Do the formulae for finding the area of the tail surface given in Mr. Grant's recent series, "How to Design Your Fuselage Model," apply to gas models also?

Answer: Yes, however on gas models the fin should be approximately 7% of the wing area and the stabilizer may be as small as 25%. This reduction in size of gas model tail surfaces over those required on rubber models is due to the centralization of weights in a gas model.

Units of the I.G.M.A.A. now exist in the following states:

New York, Pennsylvania, New Jersey, Massachusetts, Louisiana, California, Nebraska, Texas, Colorado, Wisconsin, New Mexico, Ohio, Minnesota, Tennessee, Kansas and in the District of Columbia. There are also units in New Zealand, Australia and Hawaii.

A Flying Consolidated Fleetster Model

(Continued from page 15)

shaft bearing. When finished, dope the inside and cover the outside with paper for added strength, cementing it to bulkhead 1 (as shown). The tail plug, which forms the end portion of the fuselage and which is 1 1/16" long, carries the ¼" dowel which fits into the hole in the center of bulkhead 8, and the two 1/16" dowel "anchorage pins" as described in perspective view of same.

Drill a ¼" hole through the front end of the tail end piece 13/16" deep, then dope inside of the hole with several coats, allowing each coat to dry thoroughly. Now cut a piece of ¼" hardwood dowel 13/16" long and drill a 1/32" hole through it from end to end.

Cement this piece into the hole in the tail piece and allow to dry, after which you force a piece of music wire through both pieces. Now bend a hook for the rubber motor at one end (as shown—side view). The other

NEW ALL-STEEL CYLINDER GIVES GREATER PERFORMANCE

Ohlsson Motors are now equipped with a new one-piece cylinder and head, machined from a solid bar of alloy-steel. Machined fins provide efficient cooling at all flying speeds. Shop and field tests prove this construction in combination with Ohlsson platinum timer points gives up to 25% greater performance from the Ohlsson Radial-Mounted Motors.

Priced Complete **$18.50** (Assembled and tested)

SEND Money Order, or send 3c stamp for complete specifications.

See your local dealer for demonstration

DEALERS—Write for particulars.

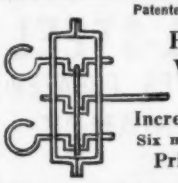
OHLSSON MINIATURES 630 North Alvarado St. Los Angeles, California

This wonderful new discovery that handles like putty and quickly hardens into light weight, durable wood—has many uses in making **model aeroplanes, modeling fuselages, propellers, engines, filling cracks, repairs, etc.** Genuine Plastic Wood holds nails and screws without splitting, can be finished like wood. Get it at hardware and paint stores.

Use Genuine **PLASTIC WOOD**

MIDGET TRANSMISSION

Patented 1931



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Wt. 1/50 oz.

Increase Performance
Six models to choose from
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MAMCO BALL BEARING SET

Minimizes Propeller Shaft Friction
10c per set—Wt. 1/100 oz.
Used in Winning Models
Ask your dealer

Dealers, Jobbers, and Kit Manufacturers: Write for price list of 35 standard metal parts we manufacture, also discounts on transmissions and ball bearing sets.

SPECIAL PRODUCTS. Let us quote you on any special metal product for gas or rubber powered models and kits.

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MODEL AIRPLANE MOTORS
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FRONTIER
45 caliber
MODEL $1.45

Colt single action army revolver FRONTIER model with machined cylinder, rod ejector and four and three quarter inch barrel.....$1.45
Above with five and one half inch barrel..... 1.55
Above with seven and one half inch barrel..... 1.70

Colt calibre 45 automatic pistol..... 1.00

Half scale **Thompson Sub Machine Gun** model kit.. 1.00
Full scale **Thompson Sub Machine gun** model kit.. 3.00

Full scale Colt cal. .45 automatic pistol kit..... 1.00
Full scale Colt cal. .25 automatic pistol kit..... .50

Savage calibre 32 auto. pistol with mach. barrel .75
Luger 9 M/M auto. pistol w/four in. mach. barrel 1.75
Same as above with six inch machined barrel..... 1.90

These beautiful kits are complete in every detail and made of the best basswood. All parts are cut to shape and require only a short time to finish.

They are to be made for display purposes and you will be more than proud to show them to everyone. Postpaid in U.S.

Send for FREE illustrated circular

GUN MODEL CO., Dept. E-24, 2908 N. Nordica Ave., Chicago, Ill.

end of the wire should be bent sharply and forced into and cemented to the outside piece. The next step is the headrest.

This part is made of 5/8" x 1 1/16" balsa and is scooped out hollow.

Cut it to the proper shape, then scoop out the core with a gouge or knife. Do not fasten this piece to the fuselage until after the latter has been covered with tissue.

Sand the framework of the fuselage smoothly, and with a piece of sandpaper wrapped over a round pencil or birch dowel, run it between the longerons and stringers thereby sanding half round scallops on the bulkheads so that the latter will not bulge through the covering. This should be done only from bulkheads 5 and 6. You will notice that the front of the fuselage between bulkheads 1 and 4 is covered entirely with 1/16" x 1/8" balsa strips. This type of covering was originated by the author several years ago and has since been used with great success on all types of models, namely scale, flying scale, gas powered and even such models as the well known Frank Zaic's "Wakefield" entry which competed in England in 1935. This covering is one of the main features of the foregoing article and when you have completed this phase of construction, you will have a very strong forward section on the fuselage.

In making this covering, you must cement each strip to all the bulkheads and pin it down to each of the latter until the cement is dry. As already mentioned, these strips extend between bulkheads 1 and 4. When you have completed this operation and the cement has dried, remove the pins and sand the surface smoothly, after which you cover it with tissue and dope it.

Landing Gear and Tail Skid

The landing gear is made of hard wood, such as spruce, birch, etc. Proceed to make the struts as shown and when shaped cut a slot in the leading edge of the main strut to accommodate the front, narrower strut and cement the latter in place. When dry, drill a 1/32" hole through the sides of each strut; one in the main strut near the slot and one in the front strut at the lower end (also near the slot) and bind them together with strong thread, after which you place more cement on each joint.

The tail-wheel housing is made of balsa. When you have carved it to the proper shape, cut a slot, large enough to accommodate the wheel clear through it. Then gouge out a small trough in the fuselage at a point where the wheel housing is fastened to it. This will prevent the tail wheel from rubbing and sticking. Fasten the wheel housing to the fuselage and when cement is dry, put the wheel in place and drive a small pin through to keep it in.

The landing gear should be thoroughly dry by this time, so the next step is to drill holes slightly smaller than the shock springs at the upper ends, where each strut touches the fuselage. Drill them as deep as the length of the protruding wire, then force the wire into the strut ends.

After you have lined up the landing gear, drill a hole through the side of the main strut (as shown in front and side views) for the wire which runs between the struts and up to both sides of the fuselage. Take a piece of music wire, bend it to the right shape and force it through the holes. At the two ends touching the fuselage, make right angle bends, (the extension on each being 1/2" long) and cut off the surplus over 1/2". Insert the wire in the fuselage and when you are satisfied that it lines up properly, go on to the next strip.

In the front view of the landing gear you can see the wheel axles. Bend two pieces of music wire to the proper shape and after inserting them in the lower ends of the landing gear struts, fasten them, first with a plier, then cement. Slip the wheels on and your gear is finished.

You will note that in the nose cone cross-section, in the side and top views of drawings, there are shown in solid black colors, the "Cowl Supporting Flanges." Make four of these as shown, and after cutting slots in the cone to accommodate them, fasten them in.

Rudder and Elevators

If you have all the ribs shaped out and the spars cut to the proper length, you can now start on the rudder. Take the "Fin" halves of the ribs, then force the 1/16" dowel front spar through each rib (as shown in side view) and cement in place. Now line up the ribs and cement the rear ends to the sheet balsa spar, as per drawing.

While the fin dries, take the "Rudder" ends of the ribs and repeat the operation with the exception that there is no 1/16" dowel in the rudder. While the cement is setting, keep the spar flat on a board, with the ribs standing upright. The elevators and stabilizer are made in the same manner as the rudder and fin, the 1/16" dowel being placed in the stabilizer only.

Proceed to make the structure and when finished with this operation, take several pieces of narrow bamboo strips and after cutting several pieces to match the different empennage surfaces, bend them to proper shapes by working them with your thumbs and forefingers. By so doing you will get them to keep their respective shapes, making it easier to fasten to the leading and trailing edges of the surfaces. This done, cement each strip in place and while the cement is setting, go on to the gussets. These are made of 1/16" sheet balsa. When you have made these, cement them in place as shown in side and top view and when the cement is thoroughly dry on all the sur-

GAS MODEL LOG BOOKS

Just what you've been waiting for, keep a record of your gas model flights and the contests entered. Beautifully bound, 48 pages, your name in gold FREE if you order right away. Sent, post paid, for only 85c.

LOOK AT THESE SPECIALS

2 and 3 inch black and silver or black and gold letters for your gas model. Each 5c.
A.C. Spark plugs, 60c. Hookup wire. 5 ft. 15c.
Booster plugs. Complete set 50c.
Finest Coils each $2. Condensers each 20c.
Sakura gas props. 13½" and 14" each 65c.
14½" 90c.
Nitrate dope, pt. can, 75c. Qt. can, $1.45.

OHLSSON MOTOR $18.50

With 14½" Sakura prop FREE—HURRY! Gas model motor kits assembled and block tested. Guaranteed.....$1.75

Send for FREE price list on all model supplies.

Orders under $1.00 add 10c postage.
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ARROW MODEL CO.
18 Austin Street New Britain, Conn.

faces, sand each smoothly. All the empennage surfaces, including the ailerons are movable. In order to make them so, hinges made of "13 gauge" sheet aluminum are provided. The hinges are shown in side and top views of drawings in solid black color.

The elevators and ailerons are fitted with three hinges each, but the rudder contains only two, as shown. In order to fasten the hinges to each surface, you must make a short slit through the spars of each surface running horizontally along the latter and extending through the ribs they touch, as shown. They should be cemented to the stationary portion of each surface, such as the stabilizer, fin and wing until after the entire model has been covered, after which you can place some cement where they connect to the movable portions.

The Wing

The wing construction is next, so take out the spars if you have already shaped them and mark the rib stations on each one. You will note that the rear and front spars are made of one piece, the front spar being reinforced by strips of 1/16" sheet stock on either side of it and extending between ribs 1, 2 and 3, on both sides of the wing center. Fasten the reinforcements in place and allow the cement to dry. Then lay the spars on the drawings edgewise, slide all the ribs in place and apply the cement at the joints. While this dries, build the ailerons, the construction of which is similar to that of the tail group. By the time the ailerons are finished, the wing should be ready for further construction. You will note in the top view that there are bamboo braces at the trailing edges, between ribs 6 and 7 and at the wing tips between ribs 12 and 13. Make the required number for each side and cement them in place as shown.

Now cement the trailing edge in place, holding it against the ribs by either pins or rubber bands. Make the trailing edge of bamboo as described in drawings. This can be made in one continuous piece from a 15" strip of bamboo. Bend it in the center and after matching it with the drawings, cement it on as shown, placing several rubber bands around it to hold it in place.

The wing tips are next; make two of them as shown in top view and cement them in place. When the tips have become firm, start to paper the leading edge to the proper curve. As shown in the front view and in the shaded sections of wing rib templates 8 to 12, you will notice that in order to bring the top edge of the rear spar (between ribs 8 and 12) on a level with the aileron spar, an extension of 1/16" sheet balsa has been added to the rear wing spar. Cement these strips in place and when cement dries, sand them to the level of top of the ribs.

Make the hinge slots in the rear spars and cement the aluminum strips in place. The wing struts are made of hard wood. Cut them to the right sizes, but do not fasten them to the wing permanently until the wing has been covered. When you are satisfied that the wing and struts line up properly, take them off the wing and start covering the entire model.

Covering

The best covering for this type model is silk tissue which comes in several different colors.

In preparing the tissue, it is wise to lay the glossy side facing upward and to place each part on the sheet, tracing the outlines of the different surfaces with a pencil before cutting the paper. In tracing, leave a margin of at least ¼" all around the wing and about ⅛" around the tail group and ailerons. For the best results in fastening the paper to the framework, ordinary white paste is the best material to be used.

Use a brush in order to spread it on the framework, but be sure the paste is not too thick. Spread the paste around the extreme outer edges, then lay the frame on the tissue, pressing the paste-covered edges against it so it will stick. Then work the tissue with your fingers until all the wrinkles have been stretched out, but do not make the covering too tight.

The fuselage should be covered in four different sections, for on account of its multiple curves, it is practically impossible to get a smooth covering with one piece of tissue. The sections of covering should extend between the four longerons, top, bottom and sides.

When all the parts have been covered,

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H. L. Gliders.....Tex Rickard
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brush or spray water on the tissue and allow it to dry thoroughly in the open air. This is known as "water-doping" and it causes the yet unbleached paper to shrink, thereby forming a smooth surface. When this operation is completed, give all surfaces two coats of aero-dope. When this is done, proceed to assemble the model. Cement the cabane struts permanently in place in the wing and allow to dry. Then cement the entire unit, (wing and struts to the fuselage). The headrest can be cemented in place next, a short distance back of the trailing edge of the wing. Then fasten the rudder and elevators in place, after which cement the tail struts between the fin and stabilizer as shown. Now make the celluloid cockpit housing and cement it in place.

The Flying Propeller

In the pictures you will note two types of props; that with two blades being the flying prop; the other for exhibition, having three blades. The flying prop is made from a blank of "poplar" wood measuring 9⅛" x 1¾" x 9/16", as shown in the perspective view of the prop drawing. Draw the diagonal lines on the wood as shown and then cut out the two side portions of it leaving the blank ready for carving. Next you whittle parallel to the perspective airfoil section, shown at each end of the block. When finished with this, lay the half template on each side of the carving and trace the outlines on it, after which you cut around the lines. Sand the blades smooth and round off the edges next, then drill a hole, the size of the rubber hook wire, through the center of the prop and then, by inserting a finer wire than the one to be used and stretching it tightly, make sure that the blades balance properly. Make the rubber hooks next. Cut a three inch length of music wire and bend a hook ⅜" in diameter at one end. Then insert the straight end through the nose plug and propeller respectively. The prop shaft, including the hook, should measure 2 inches from the leading edge of the prop to the rubber hook end. Cut off ⅜" from the propeller end and make two bends in it, each measuring 5/16", which will fasten onto the front end of the prop. Now drill a hole in the leading edge of the prop 5/16" above the center hole and force the bent end of the shaft in place, after which you put some cement over it. Now hook the rubber in place and the model is ready for flight.

The Scale Propeller

Should you wish to use the model for exhibition purposes, drawings for scale prop are also included along with those of the flying prop. The scale prop is made of hard wood, dimensions of which you see in the drawings. When you have obtained this size wood, trace the outline of the prop on the three blocks to form the blades and cut them out and carve them. Then join all three blades together at the hub and cement them with "Casein" glue; this will make a very strong joint. Allow it to set for several hours; meantime either carve or turn the spinner-cap on a lathe and drill a small hole through it for the shaft. When the glue on the prop hub has dried, glue the spinner cap to the front of the hub and drill clear through both sections. Allow the glue to set, then give the entire propeller several coats of dope, sanding each coat smoothly.

It is now ready for painting with aluminum paint. Give it several coats of the latter repeating the process of the aero-dope. For a shaft you can use the same type of wire as on the flying prop.

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"BB"—Connection of Plates 2 and 4 at sections "B-B"
"CC"—Connection of Plates 4 and 5 at sections "C-C"
"DD"—Connection of Plates 1 and 3 at sections "D-D"

List of materials to be used in model "Fleetster"

Letter	*Name*	*Material*	*Dimensions*
"B"	*Fuselage Bulkheads*	*Balsa Sheet*	*1/16" Sheet Balsa*
"E"	*Elevator Ribs*	*Balsa Sheet*	*1/16" Sheet Balsa*
"R"	*Rudder Ribs*	*Balsa Sheet*	*1/16" Sheet Balsa*
"W"	*Wing Ribs*	*Balsa Sheet*	*1/16" Sheet Balsa*
"A-S"	*Aileron Spars*	*Balsa Sheet*	*1/16" x 3/8" Balsa*
"A-P"	*Anchorage Pins*	*1/16" Birch Dowel*	*1/16" Diam. Dowel*
"B-C"	*Balsa Covering*	*1/16" Balsa Strips*	*1/16" x 1/8" Strips*
"C-B"	*Cross Bracings*	*1/16" Balsa Strips*	*1/16" x 1/8" Strips*
"C-S"	*Cowl Supports*	*Balsa Sheet*	*1/8" x 3/4" Sheet*
"F-S"	*Front Spar*	*Balsa Sheet*	*3/32" x 3/4 Sheet*
"H"	*Hinges*	*Aluminum Sheet*	*Gauge .013*
"H-R"	*Head Rest*	*Balsa Block*	*5/8" x 1 1/16"*
"L"	*Longerons*	*Balsa Strips*	*1/16" x 1/8" Strips*
"L-E"	*Leading Edge*	*Balsa Sheet*	*1/8" x 5/16"*
"N-C"	*Nose Cone*	*Balsa Block*	*2-1/8" Sq. x 1½"*
"R-S"	*Rear Spar*	*Balsa Sheet*	*3/32" x 3/4"*
"T-E"	*Trailing Edge*	*Balsa Sheet*	*1/32" Sq. Bamboo*
"T-P"	*Tail Plug*	*Balsa Block*	*5/8" x 1⅛" Block*
"W-S"	*Wing Struts*	*Spruce Strips*	*3/32" Strips*
"L-S"	*Landing Gear Struts*	*Spruce Strips*	*1/8" Strips*
"T"	*Wing Tips*	*Balsa Sheet*	*1/16" Sheet*
"S.S."	*Strut (Landing gear and wing) Supports*		*1/8" x 3/8" Strip*

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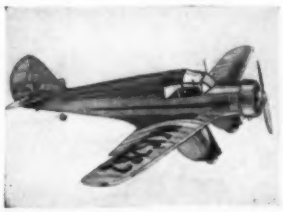

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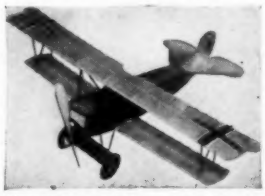

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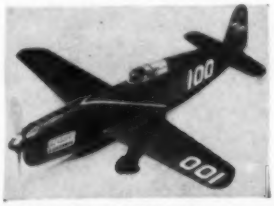

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. . . and here are two from the Megow 25c line

(On orders combined to equal $1.00, postage only 25c)

MODEL BUILDERS: *Mail this Coupon for big 24-page Catalog!*

DEALERS: Write for our new local contest plan. It's a business-getter . . . a money-maker.

MEGOW'S

Dept. MA, Howard and Oxford Streets
Philadelphia, Pa.

Chicago Office and Warehouse: 627 Lake Street, Chicago

MEGOW'S, Dept. MA, Howard and Oxford Streets, Philadelphia, Pa.

I am enclosing 5c in postage for latest 24-page catalog of Megow Airplane and Boat Models.

Name .....

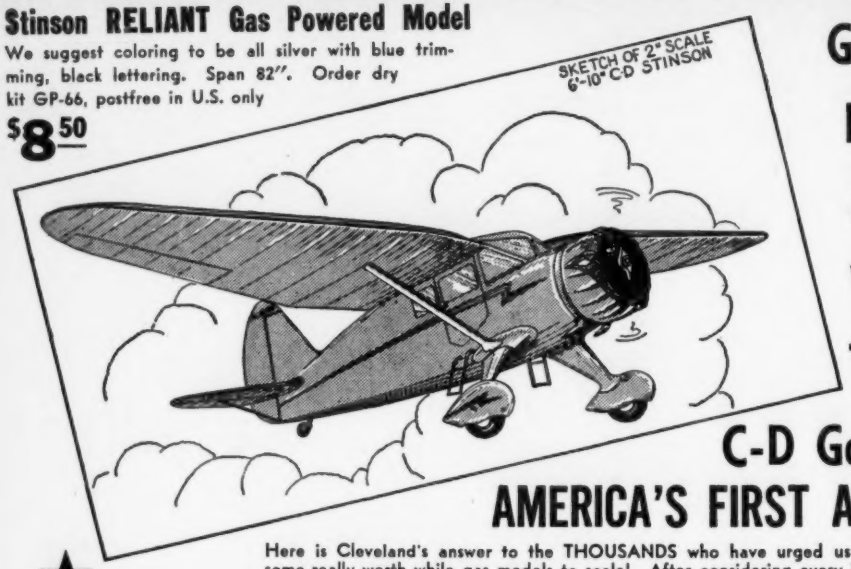
Street .....

City ..... State .....

Stinson RELIANT Gas Powered Model

We suggest coloring to be all silver with blue trimming, black lettering. Span 82". Order dry kit GP-66, postfree in U.S. only

$8.50



Gas Model Enthusiasts Are Going Wild Over These Two

Rearwin SPEEDSTER Gas Powered Model

Model recommended to be colored all silver with brilliant red striping and black lettering. Span 64½". Order dry kit GP-69, postfree in the U.S. only

$4.85

C-D Gas-Powered Flyers

AMERICA'S FIRST AUTHENTIC SCALE GAS MODELS

Here is Cleveland's answer to the THOUSANDS who have urged us to design some really worth while gas models to scale! After considering every imaginable type of airplane, we finally selected the Rearwin, and the Stinson as the two most popular of all gas model designs, because they had, with slight adjustments, good inherent stability for gas powered flights. In addition to these, both are designs that allow something of a variety and we believe each is easy enough for the beginner, as well as especially interesting to the old timer, who knows gas model thoroughbreds when he sees them!

Both models are suitable to be powered with any motors of approximately ¾" to ⅞" bore, which includes any of the Cleveland Tom Thumb series motors, Baby Cyclone, Brown Jr., Mighty Midget, Gwin and others similar. Of course the performance of each model will vary with the engines employed; for with the various sizes (bore and stroke) the power will change and consequently affect the performance of each model's flight. Of course, the best performance may be expected with motors of the largest size.

We do regret extremely that our experimental models were not yet ready for photographing at the time this issue of MODEL AIRPLANE NEWS was going to press. We waited until the last minute to insert this but it was still impossible to do so. We do expect to show the photograph just as soon as we possibly can—but we do back this with our word, our C-D guarantee, the model shall look precisely as the artist's sketches show them here.

In accordance with our adopted gas model policy, these dry kits are sold without the power unit, as is the standard practice; and we have also eliminated the supplying of wheels (and wheel shoes where designs require) to enable the model builder to select whatever wheels suit his fancy; and because many do not like wheel shoes on gas models, these may be eliminated entirely. These are eliminated but may be purchased separately if desired. For instance, for these models we have developed a 3½" balsa wheel with bronze bearing at only 45c per pair. Wheel shoes to suit either model also available. Per set, with four routed out cavities, drilled to fit up to 3½" wheels only 95c. Of course M & M or any other type wheels may also be employed (3¼" size, $1.50; 3½" size, $3.50). Larger wheels may also be employed if wheel shoes are not used. Thus these dry kits, as ALL C-D kits are now produced, mean that there are no liquids (cements or dopes) supplied, but if you do not have any liquids on hand when purchasing either of the models, we recommend buying at least ½ pint of the balsa wood cement (55c, plus 15c packing charge) to start. Thus you have your own choice of any colors in the dopes you require and especially on quantity you may buy as little or as much as you like.

WHAT C-D GAS POWERED KITS CONTAIN

Before we explain these all-important details, please understand that both models really look beautiful even before the covering is applied. The wonderful appearance of the really strong built-up ribs, (all very simply made in a very few hours) add much of this appearance due to the shock absorbing landing gear details, adjustable wing struts, removable wings, removable power unit, the movable control surfaces, etc., necessitating the inclusion of many more materials and supplies than the average "gas model kit" contains.

The parts the kits contain are of course all the necessary strips and sheets, balsa wood, pine or bass and aircraft specification plywood, etc., and the necessary curved parts printed out on finest quality balsa, all necessary solid blocks required, all the necessary tough "bamboo" tissue covering, thick celluloid for windshields and cabin windows, heavy music wire (not weak spring wire usually supplied), all the necessary aluminum sheets and tubes, screws, brads, small diameter special wire, etc., etc. A truly worth while quantity of materials for the price. Of course both models do contain exceptionally large and thoroughly engineered, full size, well detailed, C-D drawings, approximately 25 square feet or more each, authentic in true C-D fashion.

The Stinson, however, includes a well turned cowl front, the balance of the cowl being easy to make the same as are all COD's and on the Rearwin, besides the solid nose, a shaped leading edge is supplied.

TO ALL "FREE LANCE" AND OTHER GAS MODEL BUILDERS!

You have perhaps been building free lance type gas models in the past, but for your next model, if you are going to build another one for spring, summer and fall flying, why not build a real scale model for a gas model (allowing for necessary dihedral suggested) like only C-D can design—pick the one you want and order it today and have it ready when you start building to prevent delay. The prices ARE low for the quality and quantity of material supplied. Order yours today! Show the others that gas scale jobs can be made to fly quite easily.

★ ★ ★ EVERYTHING YOU NEED IN GAS-POWERED MODEL PARTS AND SUPPLIES ★ ★ ★

AIR COOLED ENGINES AND KITS (POSTFREE)

All complete with plug, coil, condenser and gas tank but no propellers or batteries.

Baby Cyclone New 1937 Model "D" ¾" Bore, 13/16" Stroke....$17.25
Brown Jr. Motor, ⅞" bore, 1" stroke....21.50
Forster Bros. Model "A" 1 1/16" bore, 1⅛" stroke....17.75
Cleveland "Tom Thumb" ⅞" bore, 13/16" stroke upright or inverted....17.25
Mighty Midget or Gwin Aero....17.50
Cleveland "Tom Thumb" kits (orders shipped only in order of receipt)....9.75

QUALITY LAMINATED PROPELLERS (FOR ALL ENGINES)

R.H. ¼" Bore: 12" Dia.—$1.65; 13" dia.—$1.75; 14" dia.—$1.85

SUPER-QUALITY LAMINATED PROPELLERS (FOR ALL ENGINES)

14, 15, 16, 17, 18, 19 and 20" diameters, each....$2.75

MISC. "GAS" ACCESSORIES

Birch Baby Cyclone Propeller 13" Diameter....1.50
Tom Thumb 12" Propeller Blank 35c, propeller....1.60
Brown Jr., 14" Propeller Blank 45c....1.65
Wheel shoe halves routed out to fit 3" to 3½" wheels set of 4.....95
Balsa Wheels 3½x1¼" with bronze bearing for 3/32 or ⅛" music wire, pair....65
3¼" M & M Wheels, pair....1.50
3½" M & M Wheels, pair....3.50
4½" M & M Wheels, pair....3.75
6" M & M Wheels, pair....4.80
A Grade Silk per sq. yard....50
AA Grade Silk per sq. yard....80
(Silk-Rearwin takes 3 yds.; Sunson 4 yds.)
Striping tape ¼" wide—10 ft. on card....15
½ pt. wood or paper cement....each..55
½ pt. C-D colored dope, any colors except bronze and gold....55
1 pt. C-D colored dope, any colors except bronze and gold....95
Midget Knife Switch single pole, single throw 25c, double throw....35
Midget tip jacks, each....09
Midget tip plugs solderless type, 9c, soldering type, 2 for....05
Junior sprayer, postage extra for ¾ lb., each....49
Senior sprayer, postage extra for 1½ lbs., each....79
3 in 1 modeler's screwdriver....15

FINEST QUALITY MUSIC WIRE

No.	Dia.	10" Long	2 Ft. Long	6 Ft. Long
12	.040(1/24)	.....¢	.05¢	.....
14	.032(1/31)	.....	.05	.....
16	.028(1/36)	.....	.05	.....

SPRING STEEL WIRE

This is a tough grade of steel wire. We offer this wire for those who do not require the bending quality or strength of music wire. This wire is often sold as "music wire" which of course is unfair. Straightened and tinned (looks exactly like music wire.)

	3 Ft.	6 Ft.
3/32" dia. (.091)	$.12	$.24
⅛" dia. (.120)	.15	.30

Please Note When Ordering Any Wire

Packing on sizes up to 5/64 we can bend in half for mailing. On sizes 3/32 and ⅛ dia. if you want them straight be sure to send the correct packing charge or we reserve the right to bend it sharply or supply two 3 ft. pieces instead of one 6 ft. piece when this is ordered.

BRASS TURNBUCKLES

Fork End Turnbuckles have one eye and one fork end with tiny bolt for fastening to metal brackets.

Body Length	Take up	Two Eye	Fork End
11/16"	½"	$ .20	$ .25
15/16"	¾"	.25	.30

ALUMINUM SHEET

Half Hard

	6x6"	6x12"	12x12"
34 .006	$ .08	$ .14	$ .25
30 .010	.10	.17	.30
26 .016 (1/64")	.11	.19	.35
20 .032 (1/32")	.14	.24	.55
16 .050 (3/64")	.28	.50	.95
14 .064 (1/16")	.32	.60	1.10

All also available in 1x2 ft. and 1x3 ft. sizes but take 36" packing charge.)

PURE SHEET BRASS

Thickness			3x6"	6x6"	6x12"
(.005)	Soft		$ .06	$ .10	$ .18
1/64"(.015)	Half	Hard	.12	.22	.40
1/32"(.032)	Half	Hard	.18	.34	.65
3/64"(.045)	Half	Hard	.20	.37	.70
1/16"(.062)	Half	Hard	.22	.40	.75

All also available in 1x2 ft. and 1x3 ft. sizes but take 36" packing charge).

ALUMINUM ANGLE

¼x½x1/16", 1, 2 or 3 ft.—per foot....$ .15
¾x¾x1/16", 1, 2 or 3 ft.—per foot....20

BRASS WASHERS

O.D.	Hole	Thickness	Per Doz.
¼"	3/32(.105)	.020	.05
⅜"	⅛ (.150)	.032	.06
7/16"	3/16(.195)	.036	.08
9/16"	¼ (.260)	.040	.12

SEAMLESS ALUM. TUB.

Supplied in 1, 2 or 3 ft. lengths.

O. Dia.	Wall	Ft.	O. Dia.	Wall	Ft.
1/32	.010	$ .25	1/32	.010	$ .15
1/64	.010	.22	⅛	.010	.12
1/16	.010	.10	⅛	.035	.12
3/32	.010	.10	5/16	.035	.13
⅛	.010	.10	⅜	.035	.14
5/32	.010	.12	⅜	.065	.16
3/16	.010	.12	½	.035	.16
3/16	.035	.12	½	.065	.18

SEAMLESS BRASS TUBE

Supplied in 1, 2 or 3 ft. lengths.

O. Dia.	Wall	Ft.	O. Dia.	Wall	Ft.
1/16	.016	$ .10	3/16	.016	$ .12
3/32	.016	.10	¼	.035	.14
⅛	.016	.10	5/16	.035	.16
			⅜	.035	.18

BRASS ANGLE

Supplied in 1, 2 and 3 foot lengths.

⅛x¼x¼	x3/64"	per foot	$ .18
5/16x5/16x3/64"		per foot	.20
⅜x⅜x	x3/64"	per foot	.22
½x½x½	x3/64"	per foot	.25
½x½x½	x1/16"	per foot	.25

ROUND AND FLAT HEAD BRASS WOOD SCREWS

			Gross
No. 0 x ¼"	12	for $ .05	$ .55
No. 0 x ⅜"	12	for .05	.55
No. 1 x ½"	8	for .05	.75
No. 2 x ⅝"	6	for .05	.90
No. 3 x ¾"	5	for .05	1.00

Packing Charge: If nothing over 18" is ordered, 15c. Up to 36", 30c; up to 72", 45c. Packing charges must be included or all material will not be shipped. If more than 5½ lbs. of liquids is ordered, an extra charge will be made.

DEALERS! Read This!

More and more dealers are finding they can do more business, make quicker repeat customers by concentrating on the C-D line. Top quality merchandise at a range of prices to meet all purses. Bigger profits per year, less effort. Try it. Write at once for discounts, etc. Clubs—Schools! Send for Club plan.

Modelbuilders—Be Sure to Read

New C-D dealers are being appointed every day—so go to your dealer to see if he handles C-D models, before ordering direct. If he hasn't C-D's, don't accept a substitute but send your order to us. It will be given immediate attention. Be sure to enclose check or money order—cash at own risk. No C.O.D.'s. Canada, Mexico, British Isles customers—add 10¢; all other countries, 20¢.

Don't forget—send 10c for 64-page C-D Hobby Catalog. See details in our ad on two center pages.

CLEVELAND MODEL & SUPPLY COMPANY, INC.

MODEL & SUPPLY COMPANY, INC.

FINEST QUALITY MUSIC WIRE

No.	Dia.	12" Long	3 Ft. Long
10	.032		
11	.035		
12	.037		
13	.039		
14	.041		
15	.043		
16	.045		
17	.047		
18	.049		
19	.051		
20	.055		
21	.059		
22	.063		
23	.067		
24	.071		
25	.075		
26	.080		
27	.085		
28	.090		
29	.095		
30	.100		
31	.106		
32	.112		
33	.118		
34	.124		
35	.130		
36	.138		
37	.146		
38	.154		
39	.162		
40	.170		
41	.180		
42	.190		
43	.200		
44	.210		
45	.220		
46	.230		
47	.240		
48	.250		
49	.260		
50	.270		
51	.280		
52	.290		
53	.300		
54	.310		
55	.320		
56	.330		
57	.340		
58	.350		
59	.360		
60	.370		
61	.380		
62	.390		
63	.400		
64	.410		
65	.420		
66	.430		
67	.440		
68	.450		
69	.460		
70	.470		
71	.480		
72	.490		
73	.500		
74	.510		
75	.520		
76	.530		
77	.540		
78	.550		
79	.560		
80	.570		
81	.580		
82	.590		
83	.600		
84	.610		
85	.620		
86	.630		
87	.640		
88	.650		
89	.660		
90	.670		
91	.680		
92	.690		
93	.700		
94	.710		
95	.720		
96	.730		
97	.740		
98	.750		
99	.760		
100	.770		
101	.780		
102	.790		
103	.800		
104	.810		
105	.820		
106	.830		
107	.840		
108	.850		
109	.860		
110	.870		
111	.880		
112	.890		
113	.900		
114	.910		
115	.920		
116	.930		
117	.940		
118	.950		
119	.960		
120	.970		
121	.980		
122	.990		
123	1.000		

Packing Charges: If nothing over 18" is ordered, 15c. 12c to 24", 20c; up to 36", 25c; up to 48", 30c; up to 60", 35c; up to 72", 40c; up to 84", 45c; up to 96", 50c; up to 108", 55c; up to 120", 60c. All material will be shipped by express unless otherwise specified.